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DEC 11 1959

PIPE LINE INDUSTRY

DECEMBER
1959

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STRONGER REPAIR WELDS
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Tips for Cold Weather Diesel Starting 36

IDEAS FOR FUTURE
Generator Gives Power From Gas Flow 38

For a "Quick Look" at this issue, turn the page . . .

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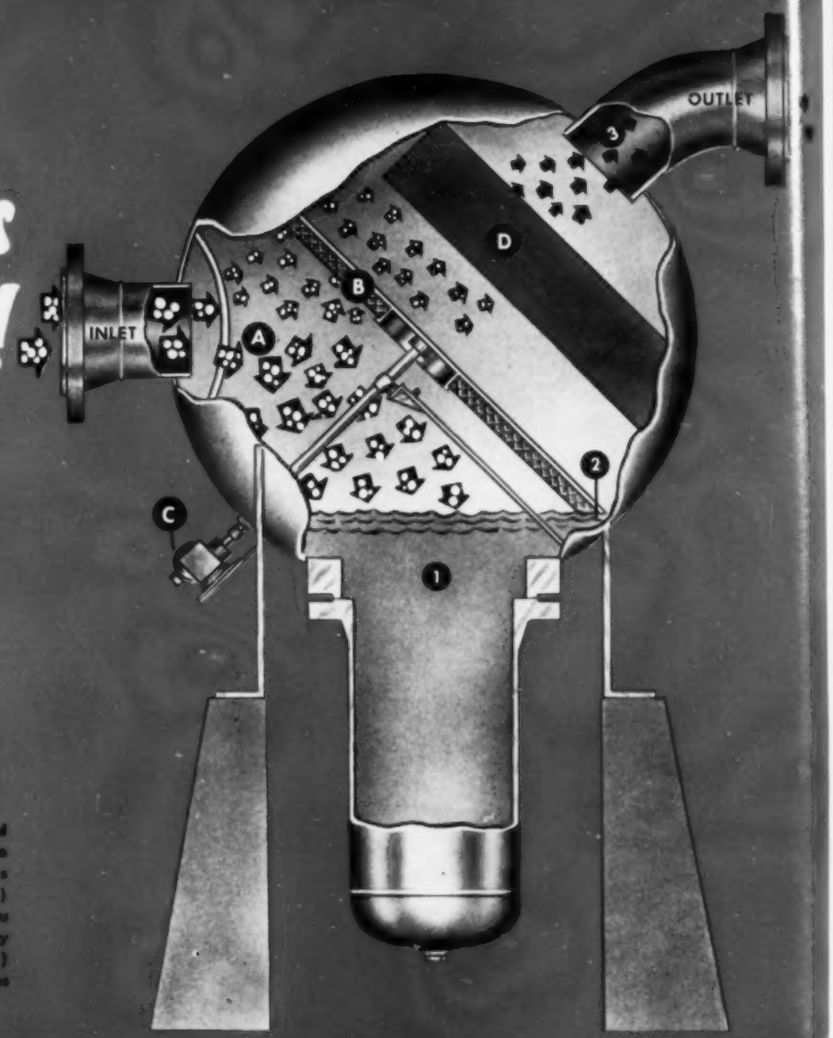
SCRUBOSPHERE*...

... FOR Cleaner Gas AT Less Cost!



*PEERLESS SPHERICAL
DUST and LIQUID SCRUBBER
FOR GAS PIPELINES

LEGEND OF ABOVE CUTAWAY

The majority of incoming liquid (A) and solid particles are directed to either side and down into reservoir (1). Lighter solid particles carried by gas stream are separated on surfaces of contactor (B) which are kept wet and clean by revolving thru liquid reservoir (2). Contactor is revolved by explosion-proof gear motor (C). Mist Extractor (D) removes any remaining liquid particles from gas stream prior to outlet (3).

- The **dust removal ability** of the SCRUBOSPHERE **is superior** because it utilizes wetted surfaces for dust collection which are much more closely spaced than in conventional equipment.
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- **Maximum performance and low cost** — The spherical design means high capacity and performance because it provides maximum dimensions for the contactor and mist extractor which normally are limiting factors in scrubber designs. The vessel cost is reduced because required vessel thickness is only one half that required for cylindrical vessel of same diameter.
- **Versatility** — separates solid and liquid particles with equal efficiency.
- **Low pressure drop** — ½ to ¾ psi at rated capacity depending on nozzle size.

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PEERLESS MANUFACTURING CO.

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Representatives in All Principal Cities

Write for test data showing dust removal and oil loss of Peerless Scrubosphere as against conventional dust scrubber.

OVER 20,000 SEPARATORS and SCRUBBERS IN SERVICE"

DEC 11 1959

PIPE LINE INDUSTRY

A GULF PUBLISHING COMPANY PUBLICATION

December 1959 Vol. 11, No. 6

CONTENTS and Quick Look

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Repairing Cold Expanded Pipe by Welding

☐ In tests performed on three joints of API 5LX-52 30-inch by 0.325-inch wall line pipe, Transcontinental Gas Pipe Line Corp. found that pits considerably deeper than the conventional 1/3-wall thickness could be successfully repaired. The pits were filled with low hydrogen weld metal (to prevent underbed cracking) and the welds were machined to the original pipe contours. Strain gages were cemented to the weld metal and the pipe was hydrostatically tested to yield. The results proved satisfactory.

By T. A. Ferguson.....Page 22

New Type Aerial Bridges On Houston Texas System

☐ Five new overhead crossings on the Houston Texas Gas and Oil Corporation line feature a number of advanced ideas. Box girder section tilt-up erection towers provide for quick economical construction with more than adequate strength. Main cable design is calculated on a modified parabolic basis assuming a uniform load on a horizontal line. Before erection, the completed pipe string and assembled suspension cable system was floated across the river. From the design principles in these bridges, the authors take a look at some of the future possibilities for low cost, overwater pipe line crossings.

By Weldon Appelt and McCall Fitzpatrick.....Page 27

New $3,000 Instrument Locates Buried Rock

☐ Ask any pipe line contractor, and he'll tell you that next to weather, rock presents the greatest hazard to successful pipe line construction. Now, pipeliners have a way to find out—not only the depth of subsurface rock, but also to determine its consistency, thanks to a simplified version of the geophysicist's seismograph. With only an hour's training, two men can operate the lightweight instruments determining whether rock can be ripped or must be blasted.....Page 32

Which Man Should You Promote?

☐ Here are some of the points you should take into consideration when faced with that tough decision of who should get that promotion. You'll want to clip this article and refer to it from time to time.

By Ernest W. Fair.....Page 35

Tips on Starting Diesels in Cold Weather

☐ Nothing's more vexing than an engine that simply won't start. Not even a kick with a hard-toed shoe helps. The trick is to help the diesel—by adding heat to the intake air or by adding a fuel which will ignite at lower temperatures.

By Herb Orwig.....Page 36

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PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

Why hide the facts?

Did you know that—

Gas utility average annual wages per employe increased 71.4 percent between the 1946-50 period and 1958, while the retail price for heating gas increased only 30 percent?

* * *

In the past 12 months the Consumer Price Index increased 1.2 percent, while hourly manufacturing earnings increased 3.37 percent?

* * *

In the 20-year period, 1939-1958, the Consumer Price Index increased 107.9 percent, while average hourly manufacturing earnings increased 236.5 percent?

* * *

Average hourly earnings have increased more rapidly than the Consumer Price Index in all but three years since 1938?

* * *

Labor costs represent 70-80 percent of the final prices of products we buy?

* * *

These are facts, not fiction. The first fact was taken from The American Gas Association's "Gas Facts", the next three from U.S. Bureau of Labor Statistics reports and the last from the U.S. Chamber of Commerce.

Chances are that few persons know anything about any one of the above statistics. To give but one example, two months ago Gov. Albert D. Rosselini of Washington State said that wages had not gone up as much as prices. This information was widely publicized throughout the northwest. Only one newspaper called the governor to task for spreading this misinformation.

It is true that increased efficiency of operations, improved equipment and automation have made it possible to hold prices down to some extent while wages shot upward. But, even these factors can go only so far—witness the almost inevitable increase in steel prices with every wage increase.

Why is it that, despite the facts, many believe prices have risen faster than labor costs in recent years? Why is it that the U.S. public demands antitrust enforcement of competitive price making, while in the market which governs the most important component of those prices—the price of labor—allows and even encourages monopolistic practices?

Prof. Edward H. Chamberlain of Harvard University sums up the answer quite simply—too many of us are economic illiterates. In his words:

". . . Nobody is surprised if higher raw material costs increase the price of the finished product; so why it should be thought that higher labor costs would have the special property of coming out of profits without affecting prices is a major mystery.

"In other words, the gains of any particular concentration of labor power are paid in the end by the general consuming public as surely as are those of any industrial monopoly. The public has exactly as much interest in the terms of the contract between labor and management as it has in industrial prices and in the prices of commodities at retail which it purchases directly.

"And the fact that the public doesn't know it is one of the major sources of power in the hands of labor unions."

Though part of the blame for this situation can be placed on labor unions, so also must industrial management and the nation's press assume their share. Industrial management generally has not informed its employes about the impact wages have on prices. Neither has the nation's press adequately informed its readers. And, of course, the labor unions have not been quick to emphasize the public interest.

Now comes the longest steel strike in the nation's history, with the threat of new wage increases and the possibility of another price hike in steel products. What a perfect time for labor, industrial management and the press to assume their responsibility of educating the U.S. public.

If such action is not taken soon, we may well find ourselves in an even wilder inflationary spiral. In fact, we may well price ourselves entirely out of the Free World market.

Why hide the facts?

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PLANT IN HOUSTON INCREASES OUTPUT OF

THE BETTER TAPE COATING

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TRADE MARK

Plicoflex, the line proved protective tape coating, combines butyl rubber and polyvinyl chloride to give these important advantages:

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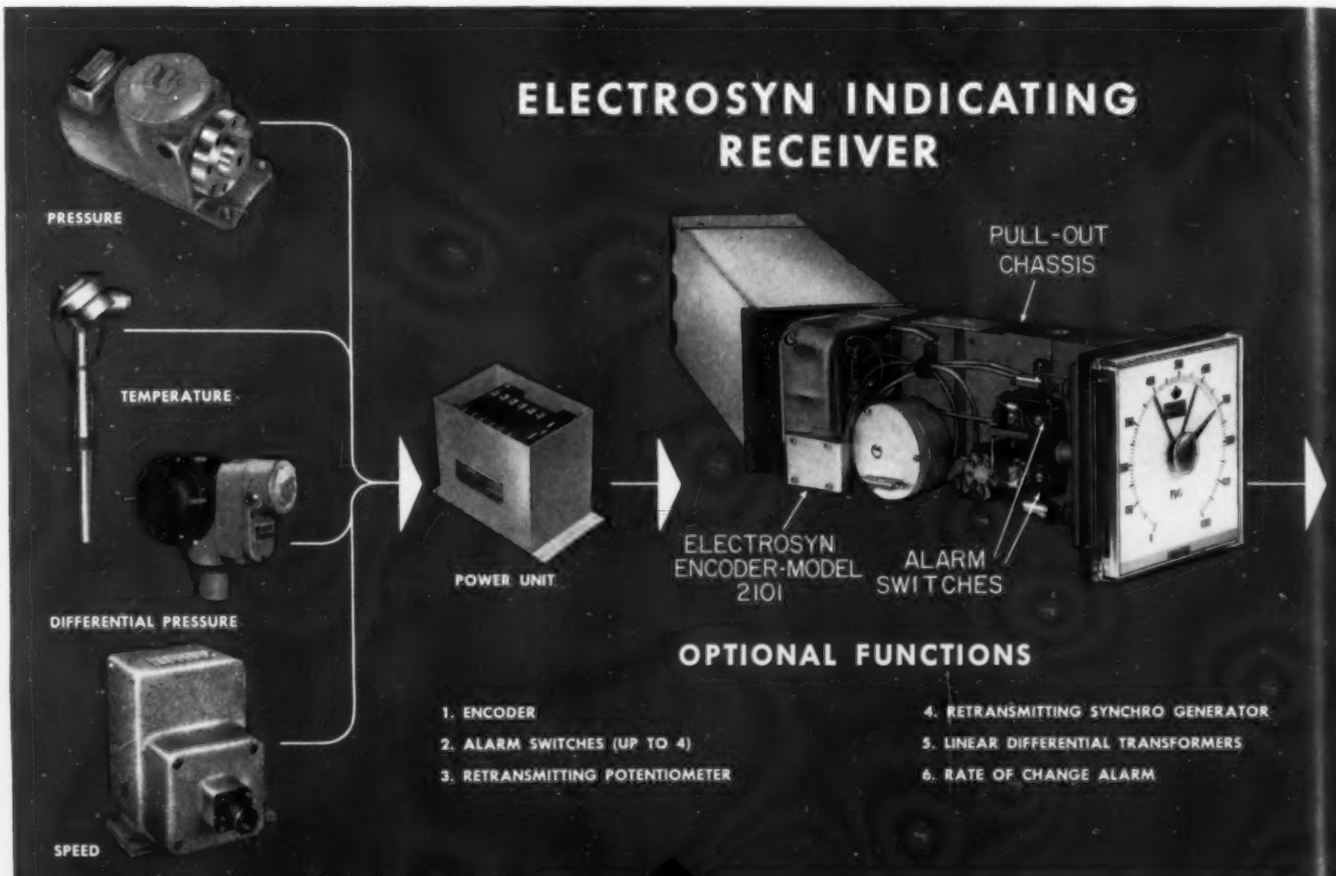
Efficient new Houston plant facilities give you improved quality tape at reduced prices.

3 reasons why Columbia-Gulf T

NORWOOD CONTROLS

ELECTROSYN

When Columbia-Gulf Transmission Company engineers first installed digital telemetering equipment on their gas pipelines, Norwood's ElectroSyn System was specified to perform pressure and other measurement and indicating functions. Success of these initial installations has led to repeat orders for ElectroSyn because its low operating and maintenance costs (plus high reporting accuracy) far outweigh its somewhat higher initial cost . . . as the following facts indicate.



PROVEN IN ACTUAL SERVICE

The Norwood ElectroSyn system has proved its compatibility with the leading digital telemetering systems and supervisory control systems. Actual installations are currently helping to cut operating costs for the following well-known users:

SERVICE PIPE LINE CO., TEXAS EASTERN TRANSMISSION CORP., COLUMBIA-GULF GAS TRANSMISSION CO., EL PASO NATURAL GAS CO., SOUTHERN PACIFIC PIPE LINES, INC., ARABIAN AMERICAN OIL CO., LAKEHEAD PIPE LINE CO.

The System

Error signal is amplified by a magnetic servo-amplifier (which can be located up to 4 miles from transmitter). Signal voltage is compared with output from a servo-motor driven feedback ElectroSyn Signal Generator. Pointer on indicator turns until signal and feedback balance and then entire system ceases to move until next transducer signal change.

Write for ElectroSyn Bulletin B258C Norwood Controls Unit, Detroit Controls Division, 931 Washington St., Norwood, Massachusetts.

Transmission Company specified

RELIABILITY

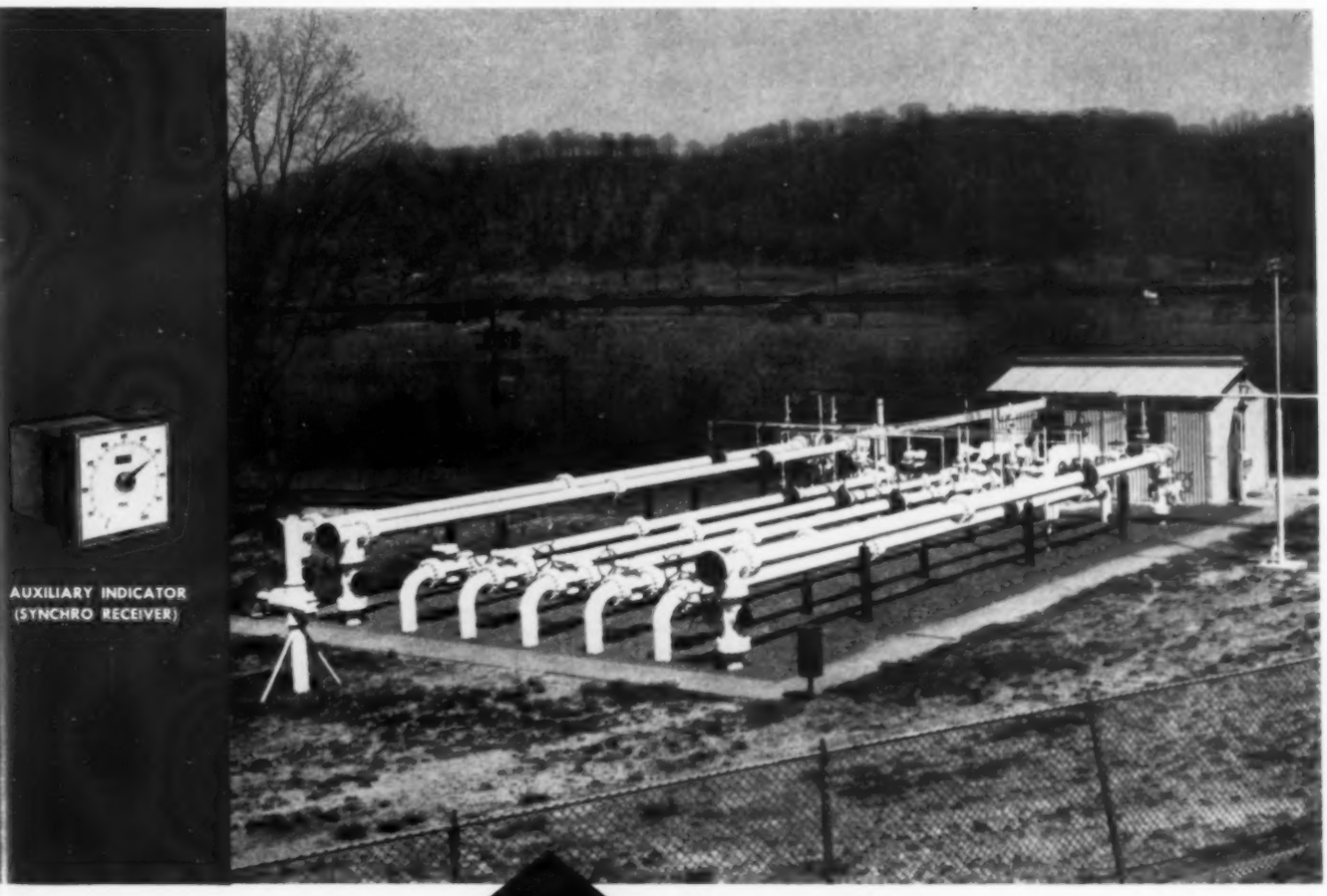
No vacuum tubes, no brush contacts, no moving parts at all under equilibrium conditions. Wear due to friction is so much reduced that truly automated pipeline monitoring and control become both practical and economical.

ACCURACY

Pressure, flow and other data are reported with close to 1% of full-scale accuracy. This not only permits lower safety margin requirements and greater throughput under conditions of high demand but also ensures maximum operating efficiency at lower pipeline pressures.

ECONOMY

results from both accuracy *and* reliability. ElectroSyn's trouble-free operation virtually eliminates breakdowns common in less reliable systems and also saves the cost of rushing repair personnel to remotely located stations.

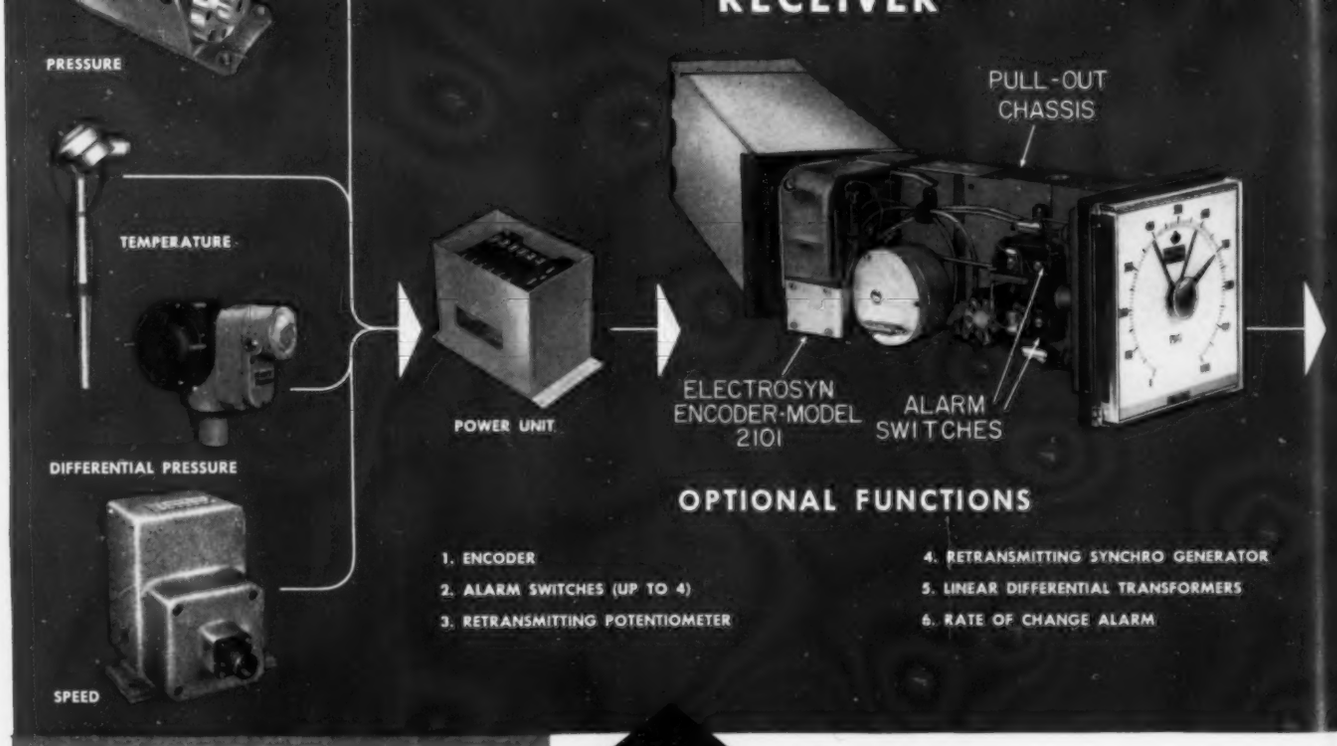


AUXILIARY INDICATOR
(SYNCHRO RECEIVER)

The Pay-off!

In remote locations like this Columbia-Gulf Transmission Company station at Leach, Kentucky, it usually takes many hours to get repair personnel to the job in the event of breakdown. ElectroSyn reliability virtually eliminates the costs of both repair and downtime. Routine maintenance costs are slashed, too.

AMERICAN-Standard
DETROIT CONTROLS DIVISION



OPTIONAL FUNCTIONS

1. ENCODER
2. ALARM SWITCHES (UP TO 4)
3. RETRANSMITTING POTENTIOMETER
4. RETRANSMITTING SYNCHRO GENERATOR
5. LINEAR DIFFERENTIAL TRANSFORMERS
6. RATE OF CHANGE ALARM

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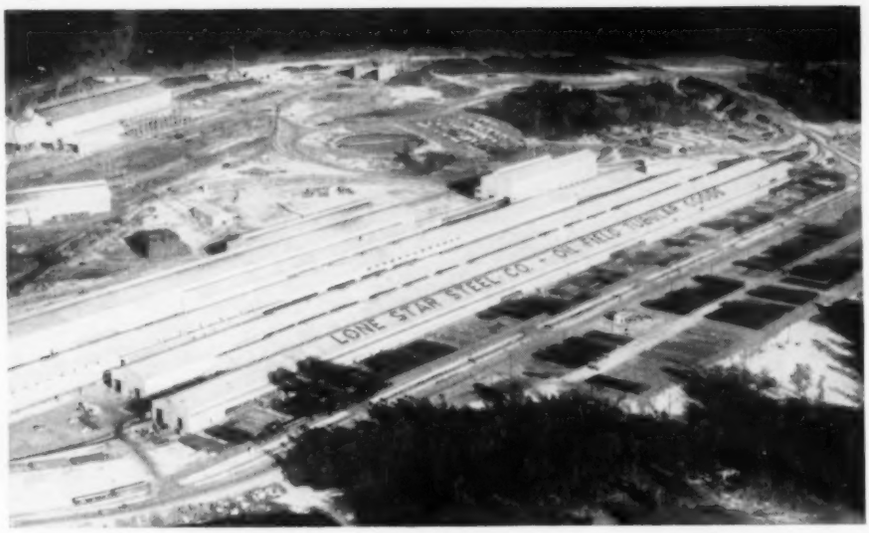

PIPE LINE INDUSTRY

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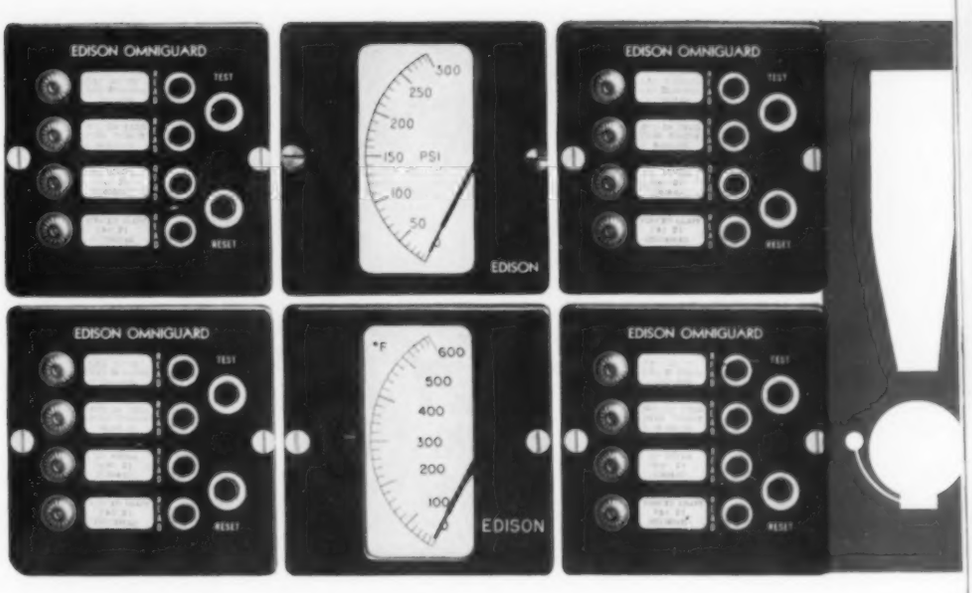
AMERICAN-Standard
DETROIT CONTROLS DIVISION

GUARD ALL CRITICAL PRESSURES AND TEMPERATURES WITH THOMAS A. EDISON LOW-COST, OMNIGUARD WARNING SYSTEM



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Generally called America's most modern steel plant . . Lone Star is primarily dedicated to supplying Joe Roughneck's API casing, tubing and line pipe needs.

Completely integrated . . Lone Star Steel's huge plant is located right in the middle of Joe Roughneck's busy mid-continent oil and gas area . . so overnight pipe delivery is routine. Tough steel and rigid and repeated tests are your assurance of API quality in every length. All Lone Star pipe is fully normalized, of course.

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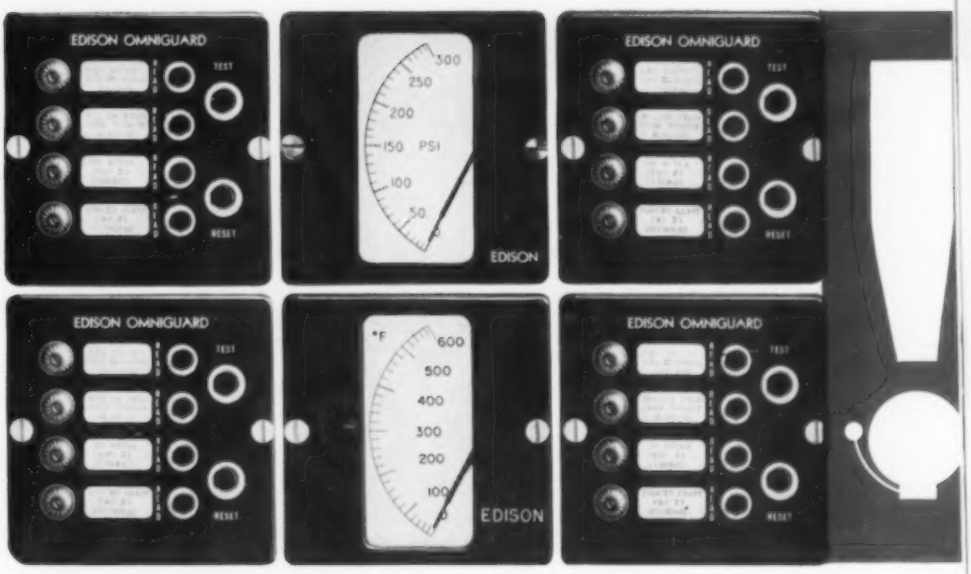
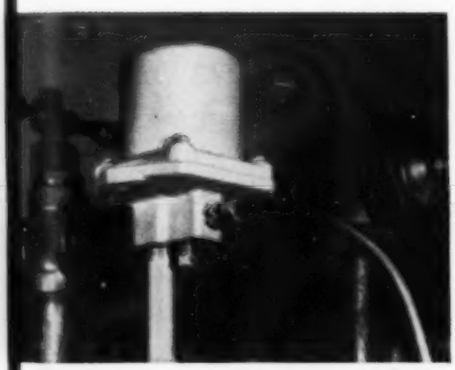
Indexed by Engineering Index

GUARD ALL CRITICAL PRESSURES AND TEMPERATURES WITH THOMAS A. EDISON LOW-COST, OMNIGUARD WARNING SYSTEM



Here is a versatile, highly-reliable continuous warning and monitoring system. By simply pushing a button on this panel you obtain a reading of *key pressure* and *temperature* points throughout your plant. In addition, this system provides instantaneous warning when pressure or temperature deviates from pre-set limits.

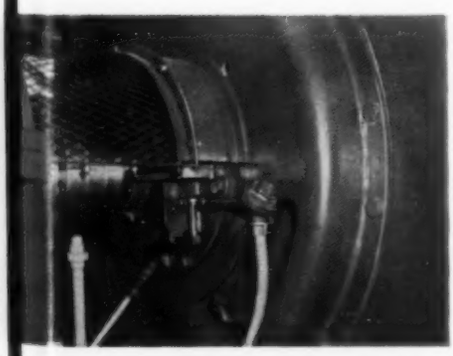


PRESSURE

With the Edison Omniguard system you can monitor gas, fluid or vapor pressure. Heart of the system is a rugged, accurate, pressure detector which converts pressure directly to electrical resistance—requires no millivolt conversion—no amplifier. For pressures under 60 PSI a precision capsule is the sensing element. From 60 to 3000 PSI special bourdon tube elements are used.

When pressure changes, resistance varies and this deviation is transmitted to the control panel. Units operate over ambient temperatures of 32° to 150°F. Control panels are available with a wide variety of scales and are equipped with both normally open and normally closed alarm contacts to operate any type of auxiliary device or to automatically shut down machinery or process.

Compact, reliable Resistance Pressure Detector transmits changes in pressure to central control panel.



TEMPERATURE

Edison Omniguard also provides reliable protection from overheating. You can monitor the temperature of bearings, gases and liquids in critical equipments or processes. Reliable Edison Resistance Temperature Detectors have no moving parts and give instantaneous warning when limits are exceeded. Unlike other systems which only scan, Omniguard is continuously monitoring. You can obtain exact readings of temperatures in all parts of your plant from one central control panel.

For greater flexibility and reliability each detector circuit is completely independent. If one circuit is damaged, all other circuits remain "on guard." When changes or additions are required they can be accomplished quickly and easily.

Rugged, accurate Resistance Temperature Detector guards against overheating of this motor bearing.

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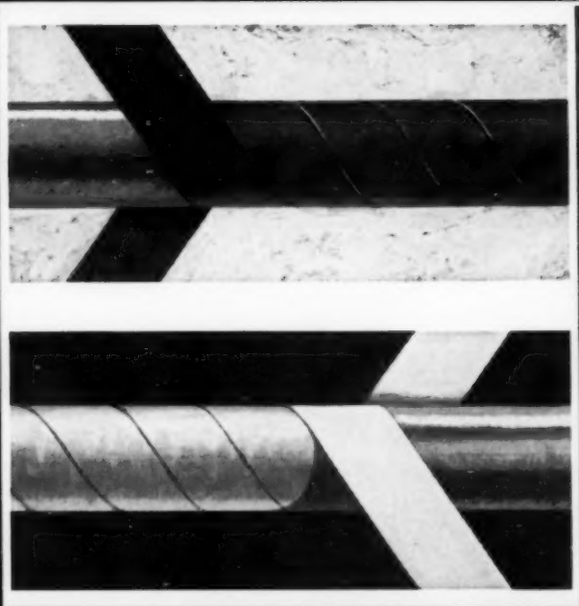

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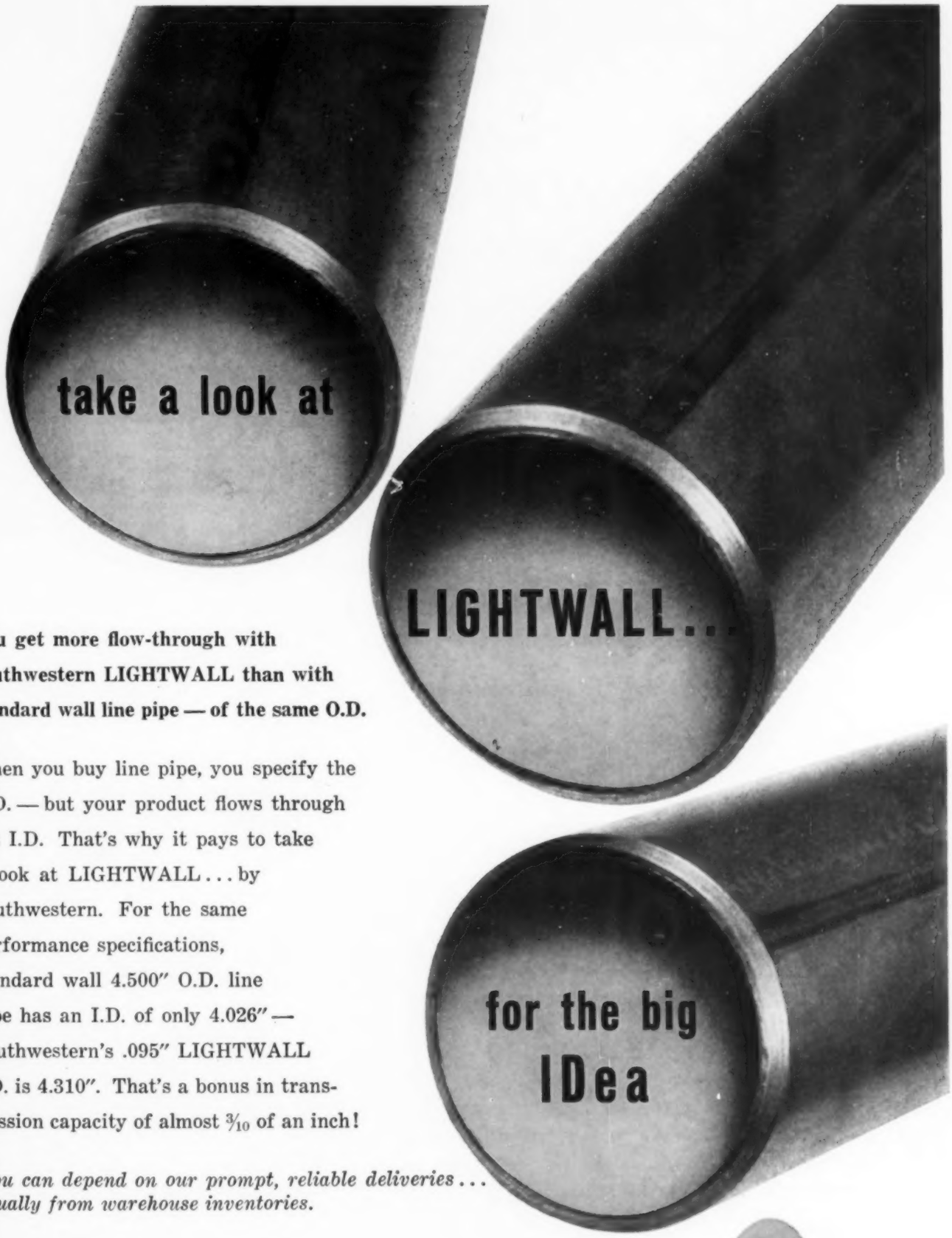

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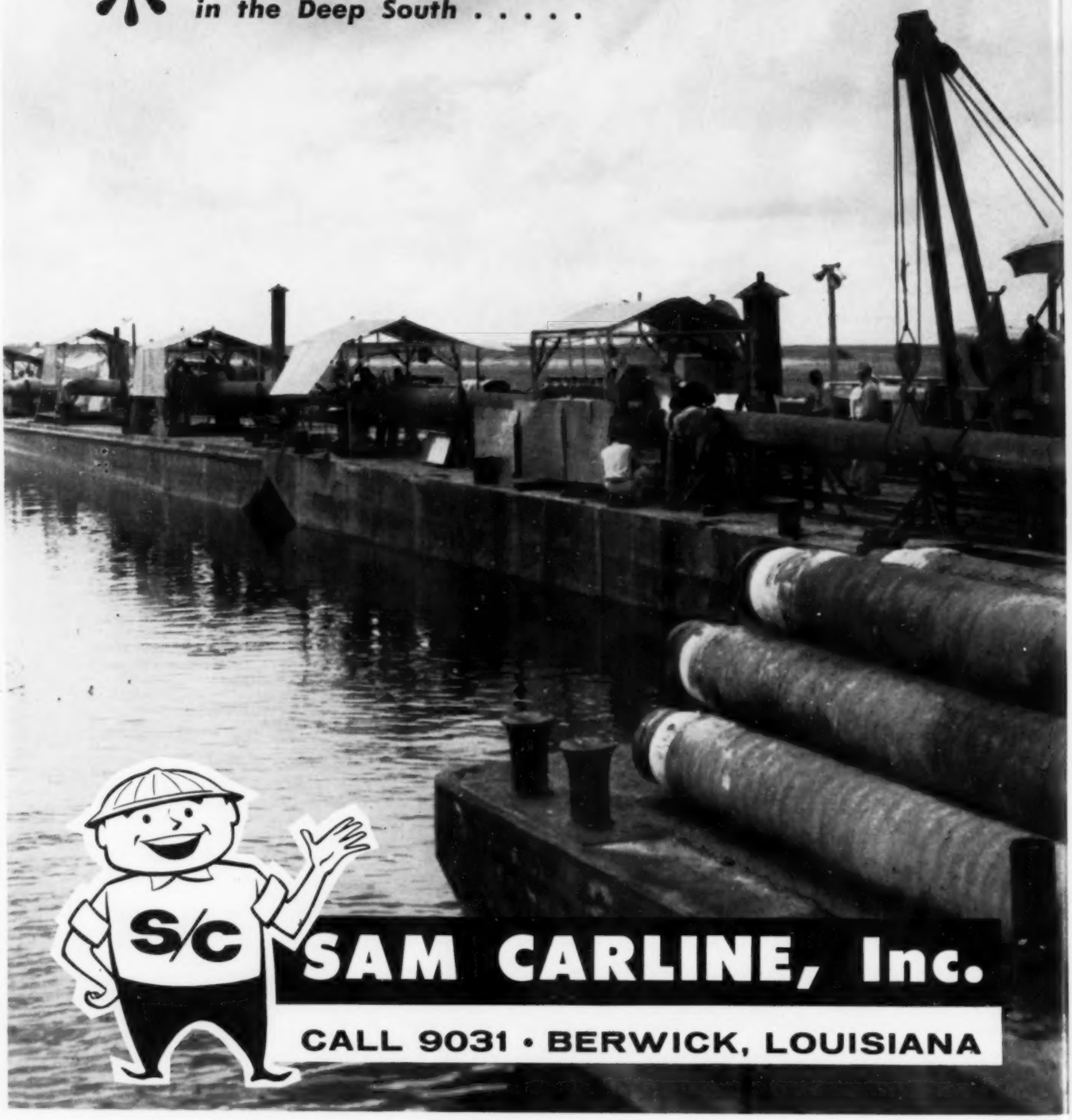

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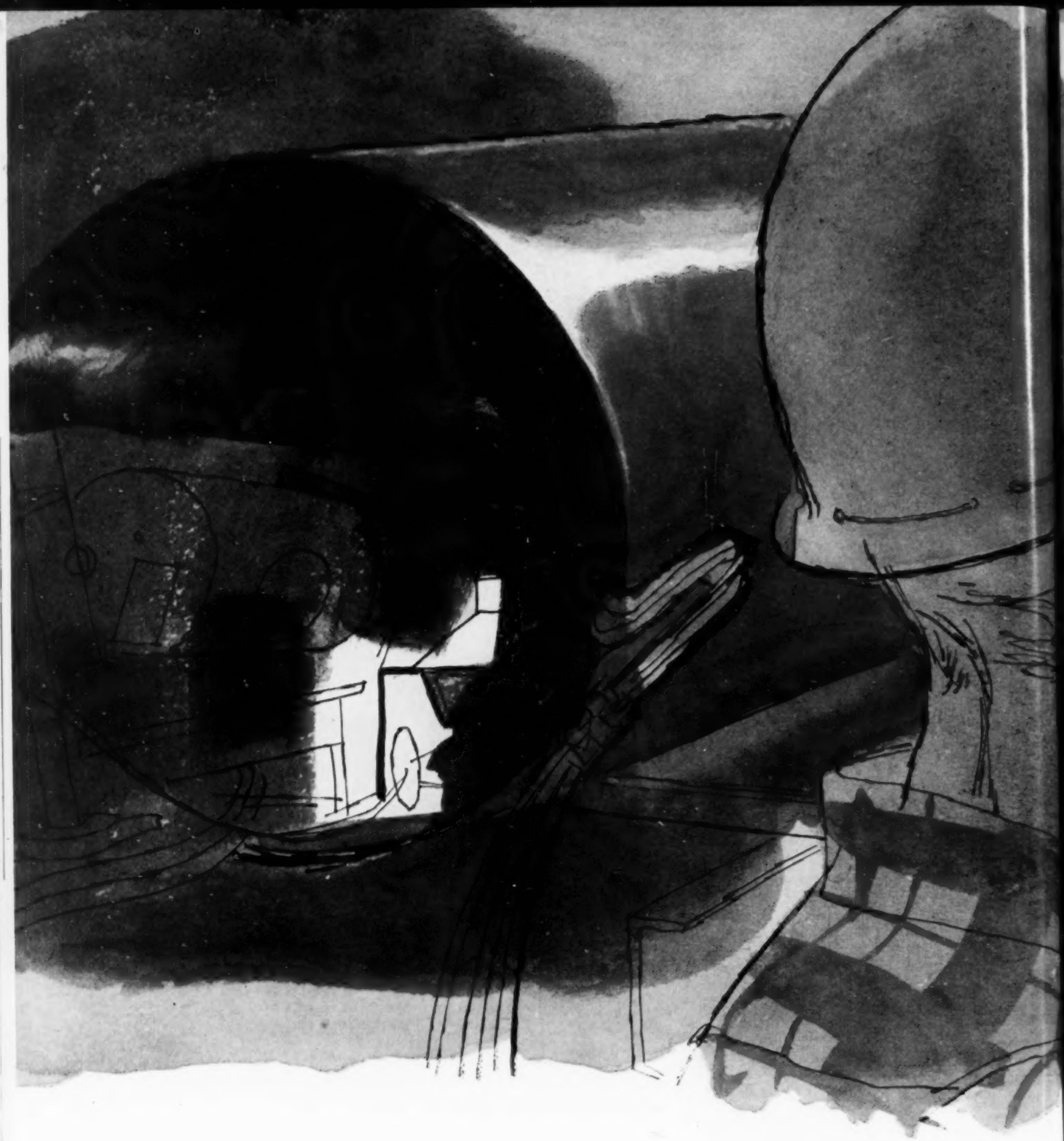

Spying on a weld

A TV camera is the spy! Located inside that hulking section of USS National Electric Weld Line Pipe, it's a visual guide to accurate welding.

The operator welds by remote control. He uses push buttons to operate a welding head inside the pipe. Just in front of the welding head is a short-focus TV camera.

When the image flashes on the TV screen, the operator sees reference lines and uses them as a guide. This enables him to keep the electrodes for the inside weld centered on the seam of the formed plate. *In short:* the TV camera makes precise guiding of the welding possible.

The constant development and improvement of production techniques are just two of the reasons why National Tube is not only the largest but also the most experienced manufacturer of tubular products in the world. For more information on USS National Line Pipe, write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania. Ask for bulletin #23.

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Higher fiber content assures more effective protection against

Carey® asbestos pipeline felt

Heavy soil conditions can really play havoc with pipe line coatings. That's why coatings alone can't give your lines positive protection. The answer is a protective wrapper between soil and coating to prevent transmission of soil stress. Only the best wrap will do this job effectively.

What should you look for in wrapping materials to assure maximum protection? Well, weight contributes greatly to the strength of the wrap, but the controlling factor is the type and percentage of fiber content.

Carey Asbestos Pipe Line Felt, as the diagrams indicate, has 10 times more fiber than Pipe Wrap "G." This toughens the wrapping material against continual soil stress, protects the coating and consequently prevents the exposure of the pipe to corrosive action. Carey Pipe Line Felt being composed of asbestos fiber will not rot or decay.

Before you buy pipe wrap, compare—not just weight but fiber content as well. Carey No. 15 Asbestos Pipe Line Felt or No. 8 Asbestos Pipe Line Felt (No. 8 contains 6 times more fiber than Type "G") assures you better protection and better performance from the coatings you use.

CAREY No. 15 ASBESTOS PIPELINE FELT
Total weight per 100 sq. ft.—14 pounds
Wt. of Fiber per 100 sq. ft.—10 pounds

PIPE WRAP "G"
Total weight per 100 sq. ft.—12.5 pounds
Wt. of Fiber per 100 sq. ft.—1 pound

REMEMBER,
only Carey Pipeline Felt is AccuRay* controlled for maximum protection on every inch of underground piping. Get complete information from your Carey Sales Engineer or write Dept. PL-12.

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THE PHILIP CAREY MFG. COMPANY, Lockland, Cincinnati 15, Ohio
Manufacturers of Carey Asbestos Pipeline Felt, Pipeline Padding, Carey Glass Pipe Wrap and Carey Glass Outerwrap

THE PROPER WIND IN SPIRAL-WOUND

It's the precise control of gasket densities for every stage in the pressure series that makes each Flexitallic Gasket right for a given flange.

Flexitallic Spiral-Wound Gaskets are engineered to meet extreme conditions encountered in keeping with the pressure/temperature rating for the specified assembly.

These controls mean that a Flexitallic Gasket, designed for an extreme pressure/temperature rating, is never so soft that it crushes under the specified load, and never so hard that it resists the compression necessary for a specified seal.

For predictable performance throughout all pressure/temperature ratings, look for Flexitallic Blue, the blue dye in the Canadian asbestos filler. It identifies the original Spiral-Wound Gasket construction.

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FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

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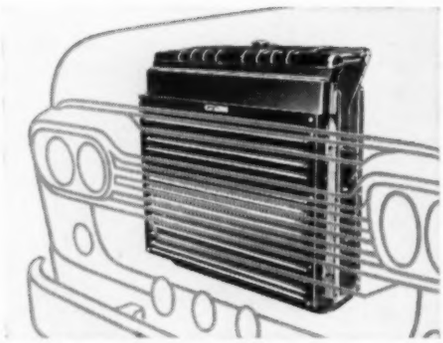
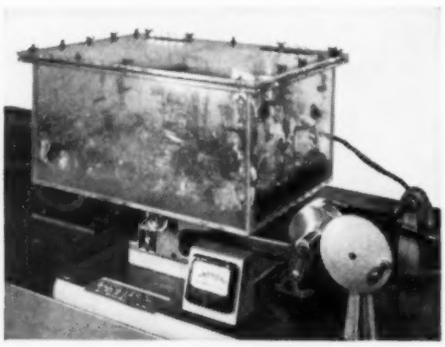
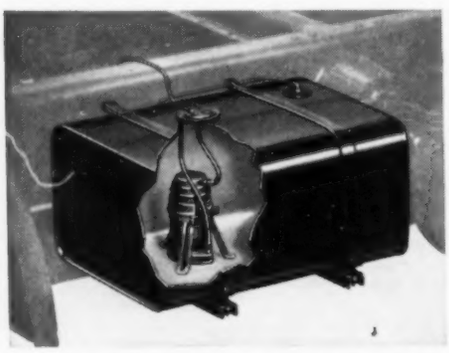


CLOSER TEMPERATURE CONTROL obtained with automatic radiator shutters means longer engine life, more efficient operation. Temperature variation between 167° and 187° with shutters as compared to 102° to 181° without shutters was reported and certified in loaded vehicle road tests.



LONGER WIRING HARNESS LIFE is the direct result of Ford's greatly improved electrical wiring system for 1960. Ford's '60 wiring harness and the 1959 wiring harness were subjected to shaker table tests plus constant exposure to oil and water vapors, and temperatures of 200°. Certified test results show a threefold increase in 1960 wiring harness life.



INCREASED FUEL PUMP RELIABILITY is an added benefit from Ford's submerged-type electric fuel pump. Certified results of dynamometer tests showed no vapor lock with Ford's electric pumps at temperatures up to 200°, whereas incipient vapor lock with mechanical fuel pump resulted in a power loss of 9% under same conditions.

It's a fact! Numerous reports from high-mileage operators of Super Duty Trucks attest to Ford's outstanding durability. Studies by an independent research firm provide certified proof that these models are even more durable for 1960.

Ford Super Duty Trucks have earned a reputation for exceptional performance and durability since their introduction two years ago. Shop service records of many leading fleets show Super Duty tractors with mileage readings between 150,000 and 250,000 and no repairs other than normal maintenance. Similar testimony to the dependability of these Big V's by other satisfied users is being added each month. Is it any wonder that '59 sales of these units were more than double those of 1958?

And for 1960, the Ford Super Duties offer additional refinements. Bigger optional axles and increased GVW's to permit greater payloads and more profitable operation. Automatic radiator shutters to keep the engine temperatures within the most efficient operating range, improved submerged-type electric fuel pumps to prevent vapor lock, and redesigned wiring for more reliable operation are typical of the improvements to be found in these units.

The changes offered for 1960 were tested and evaluated by a leading research organization. Certified results of the studies by this impartial firm (name available on request) provide proof that Ford's Super Duty Trucks are even more dependable.

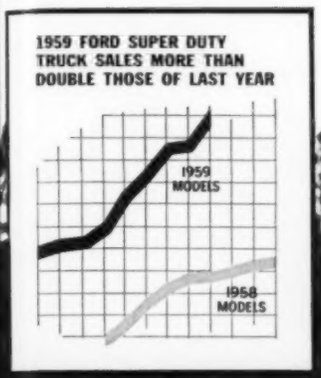
- **Certified Durability through closer temperature control!** Independent research engineers certify that Ford's thermostatically controlled radiator shutters kept water temperature between 167° and 187° in severe mountain grade operation. The test truck with shutters blocked open under same operating conditions had a temperature range from 102° to 181°. The temperature variation of only 20° with shutters means less expansion and contraction in block and heads. Higher, more constant temperatures permit oil to circulate more freely, reducing internal friction. All these factors contribute to longer engine life.

- **Certified Reliability with longer-lived electrical system!** Thicker insulation on wires resists deterioration by heat, oil and gasoline. Asphalt-impregnated loom and plastic-coated mounting clips protect against abrasion. Certified results prove that the 1960 wiring harness has three times longer life.

- **Certified Reliability with Ford's submerged-type electric fuel pump!** Dynamometer tests of engines with submerged-type electric fuel pump and conventional mechanical type showed that vapor lock was non-existent with Ford's electric pumps at temperatures up to 200°, whereas incipient vapor lock with mechanical pump resulted in a power loss of 9% at an underhood temperature of 200°.

Endurance tests were run on alternators, two-speed axle speedometer adapters and other related components with similar results. Get all the facts at your Ford Dealer's now!

in Ford Super Duties!



"Our first Ford C-1000 tractor has logged 190,000 trouble-free miles since March of '58,"

says Robey W. Estes, Vice President and General Manager of Estes Express Lines, Richmond, Va. "We haven't had a single road failure and we only bring it into the shop for regular preventive maintenance work once a month.

"We use the 477 engine and find oil consumption is exceedingly low . . . only one or two quarts added between 3000-mile oil changes. Engine compression at 190,000 miles is still high and fairly equal and our drivers say that power and pep are at about the same level as when the truck had been run only 60,000 miles.

"We are grossing between 52 and 56,800 pounds with our Ford Tilts. They are giving about the same gas economy and better oil mileage than other makes in our fleet. We bought our fourth Ford C-1000 tractor last month and hope to add more soon."

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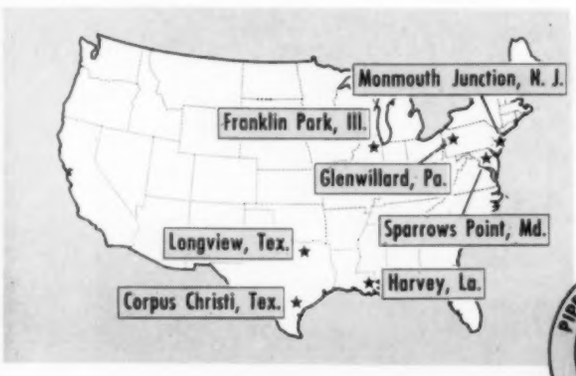
LESS TO OWN . . . LESS TO RUN . . . BUILT TO LAST LONGER, TOO!

time tells a tale of pipeline protection permanence!

Even where highly corrosive soil conditions exist, PLS coated and wrapped pipe installed underground for many years reveals a complete absence of corrosion. A surface as rust-free as the day it came from the mill . . . positive proof of the protective value of PLS service. Time proves its permanence! So why not make sure your next coating and wrapping job is done the time-tested PLS way? There's a PLS plant conveniently located to meet your processing requirements and to assure positive delivery WHEN you need it . . . WHERE you need it. Write today for complete information.



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Quality pioneers
in coating and wrapping pi
for over a quarter century

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PIPE LINE PANORAMA

Lube Oils are Important Factor in Preventive Maintenance . . . Studies reveal that lube oils rarely cause engine failure. However, engine conditions can cause lube failure.

Thus, Mobil Oil's theory, "Keep a check on lube oil to keep a check on the engine."

This is basis of nine-year-old lube analysis program which includes sampling all the company's large engines and turbines once every 4 months, recording sample results on data sheets, plus recording test results on viscosity, water (percent by weight), and neutralization number. Program has saved company many thousands of dollars in repair bills.

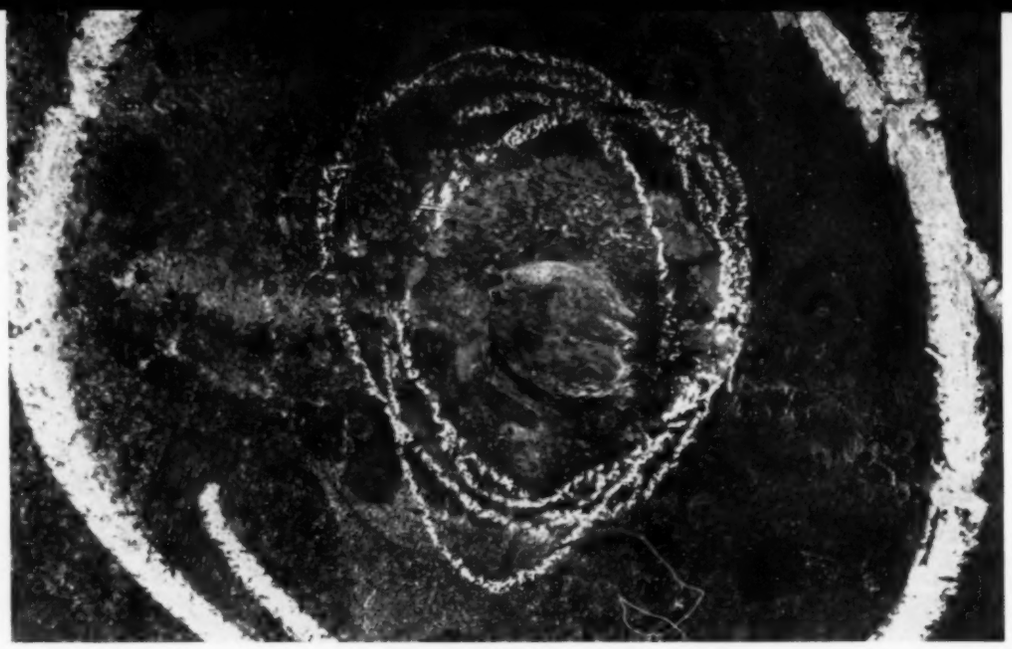
If You Want Line Pipe—Plan Ahead. . . Even if steel strike isn't resumed after 80-day injunction, steel men have little hope for inventory rebuilding before late March or early April. Result: Many specialty items will be in short supply for several months.

Republic Steel's Sales Manager J. W. Owings warns: Demand for flat-rolled steel and other steels usually available to make seamless pipe will be hot and heavy from auto makers and other manufacturers during 1960. Unless oil and gas industry does some immediate soul searching, it is very possible that the other guy will get his bid in first, and wind up with the most. Long-range planning now will save big headaches later.

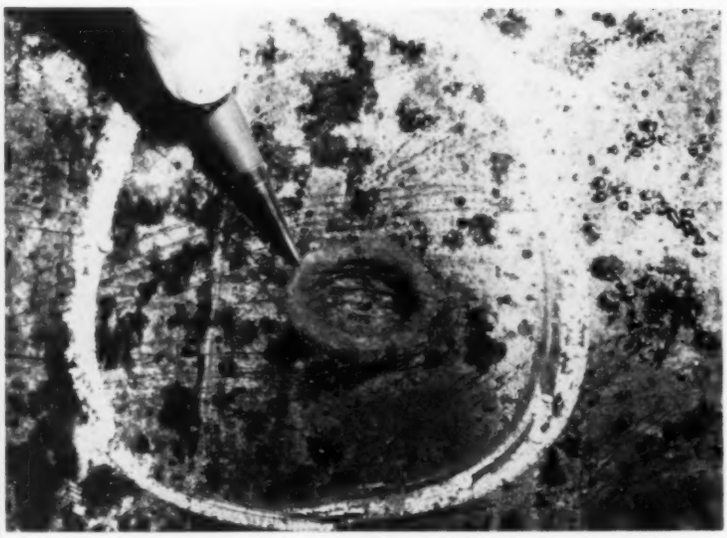
American Gas Association Predicts Rosy Future . . . Value of gas utility and pipe line industry gross plant will increase nearly three times to $34.4 billion by 1970, according to recent AGA forecast. Other predictions:

- $16.4 billion will be used to expand transmission facilities, increasing mileage from present 165,400 to 282,400 by 1970.
- $10.9 billion will be spent on distribution system construction.
- Gas sales should double in next 12 years, from 80.3 billion therms in 1958, to 162 billion therms.
- Gas sales revenues are expected to increase from $4.6 billion in 1958 to $11.8 billion in 1970.

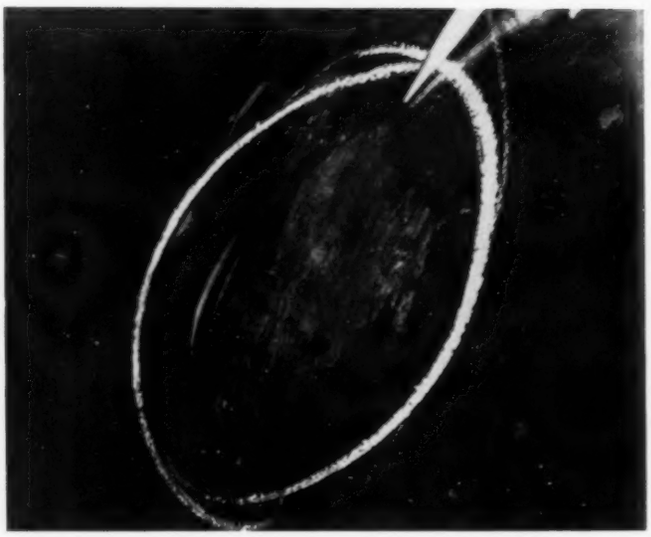
Washington Panorama . . . With FPC approval in its pocket after two years of debate, Midwestern Gas Transmission now is awaiting Canadian green light to build 504-mile, 24-inch line from Emerson, Manitoba, to Marshfield, Wisc. . . . **U. S. Third Circuit Court of Appeal's recent decision** that FPC has no right to control the end use of natural gas, if not contested, may well result in more utilities purchasing natural gas at the wellhead; and possibly more producers trying their hand in the transmission business . . . **Oil industry leaders are sparking all-out attack** on coal's effort to bring about end-use controls on all fuels through adoption of a national fuels policy; they say coal is trying to eliminate competition from natural gas and some oil products in certain markets by using false statistics . . . **Industry and government spokesmen agree** that next move to free natural gas producers from utility-like controls will have to come from the White House. Little action is expected in '60 unless such support is offered (unexpectedly).



Repair Areas No. 1 on Test Joint No. 1. This circular pit was about one inch in diameter and 0.220 inch deep on the outside wall of 30-inch, 0.325 wall API 5LX-52 pipe. After repair with low hydrogen electrodes, the area was tested with a strain gage, the results of which are found in Figure 4.



Repair Area No. 3 on Test Joint No. 2. The corrosion pit here actually had penetrated the pipe and was a pin hole leak. Most manufacturers' specifications limit repairs to pits with less than 33⅓-percent penetration of the pipe metal.



The largest pit repaired. This is Repair Area No. 1 on Test Joint No. 2 prior to welding flush and grinding smooth. After repairs were complete, a strain gage was cemented to the weld metal and the pipe was hydrostatically tested.

The control Test Joint No. 3. This pipe was tested without repairs to determine whether or not there was any correlation with the repaired sections and to see if the theoretical yield point was reduced by these defects.

Repairing Deep Pits in Cold Expanded Pipe by Welding

What you can expect from welded repairs of pits and gouges in API-5LX-52 pipe using low hydrogen electrodes

By T. A. Ferguson, Senior Welding Engineer
Transcontinental Gas Pipe Line Corporation, Houston

WELDED REPAIRS of deep pits in cold expanded pipe proved satisfactory in recent tests conducted by Transcontinental Gas Pipe Line Corp. The tests were made on three joints of 30-inch, 0.325-wall API 5LX-52 pipe. Engineers welded up all of the pits in two of the joints, using low hydrogen electrodes to prevent underbead cracking, machined the weld metal to the original contour of the pipe and hydrostatically tested each joint after cementing strain gages to each welded repair. The third joint of pipe was used for a control test.

The accompanying results of the tests indicate that we can expect satisfactory results from such repairs—even though the pits are considerably deeper than those upon which repairs are recommended by manufacturer's specifications.

Manufacturer's Specifications. Referring to the manufacturing specifications, *welded repairs are allowable on defects when the depth does not exceed 33⅓ percent of the tabulated wall thickness and where the length of that portion of defect that exceeds 12½ percent is not greater than 25 percent of the tabulated outside diameter of the pipe. The repaired areas must be hydrostatically tested to 90 percent of the specified minimum yield strength. Only one repair is allowed along a length equivalent to ten times the outside diameter of the pipe.*

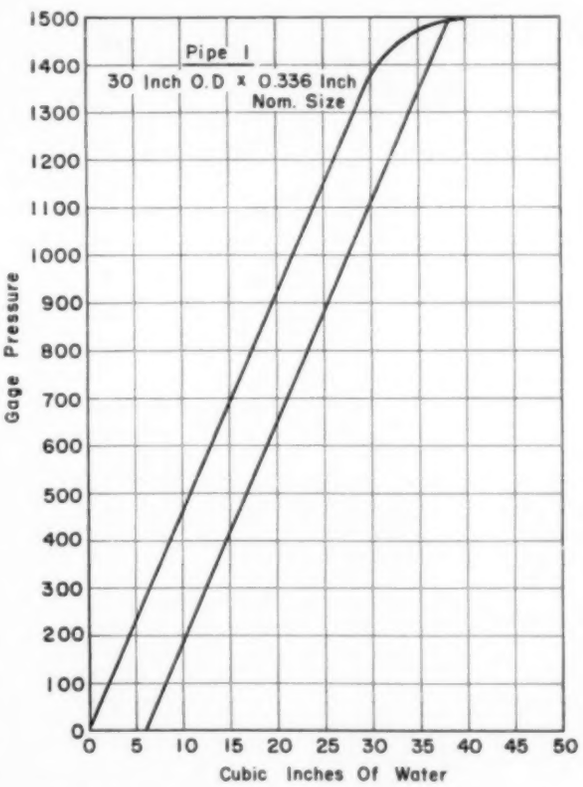


FIGURE 1—Cubic inches of water added to the 30-inch x 0.336-inch Test Joint No. 1 to raise the pressure to yield. This volume was sufficient to produce 0.2 percent volumetric offset—definition of yield.

The problem confronting an operating company is whether welded repairs made to defects on pipe in service will satisfactorily withstand all of the tests required by the specifications and whether or not the limits of these specifications should be broadened to allow such repairs with the assurance of obtaining a quality weld repair. Obviously, if the defective material could be repaired instead of replaced, a considerable savings could be realized.

If a repair were made to a defect on an existing line, all of the test required could not be carried out, i.e., the retesting of the piece to 90 percent of the yield strength. The minimum yield strength of cold-expanded X52 line pipe is achieved through the cold working effects from cold expansion. But heat treatment can remove this increase in mechanical properties due to the cold working effects.

Effects of Welded Repairs. This brings up several questions regarding welded repairs on this pipe: **What effect does the high temperature from welding have on the cold-worked mechanical properties?**

What is the degree and effect of welding stresses in the repaired areas?

What effect does the depth or area of the repair have on the first two questions?

To answer these questions completely, considerable investigation and research is required. The size of the defect

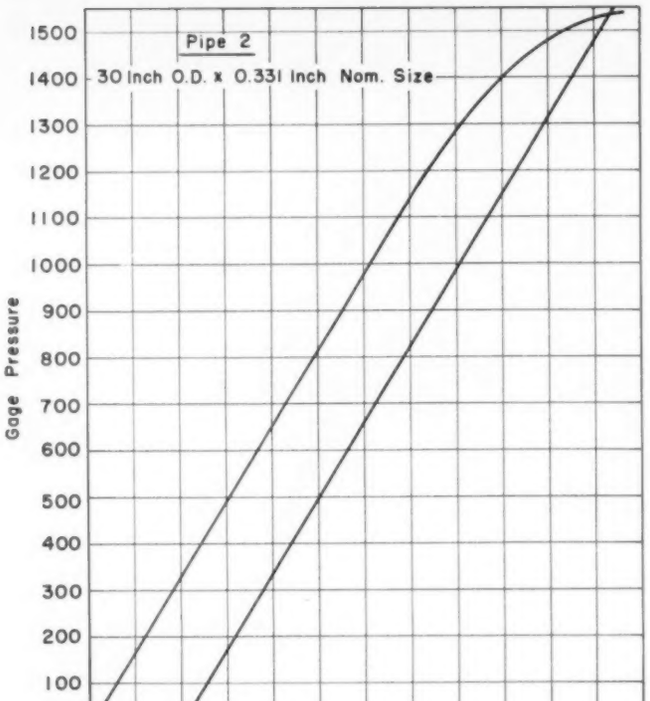


FIGURE 2—Cubic inches of water by volume added to Test Joint No. 2 after initial filling for hydrostatic test. The yield point of this joint was found to be 1,545 psi.

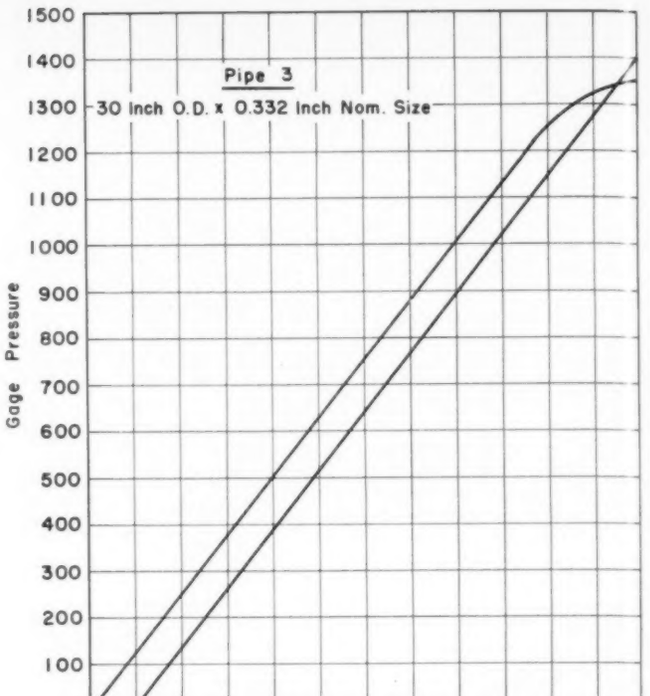


FIGURE 3—Cubic inches of water added to Test Joint No. 3 after initial filling. The yield point on this joint was found to be 1,350 psi.

itself is a very important factor involving two channels of investigation. First, the original question as to the effect of the welding stresses for a given area and secondly, what size defect actually does reduce the yield strength of the pipe. The seriousness of a notch has been brought out by past research and reports and will not be covered here. However, it is apparent that at some point, the area of a defect will be such as to reduce the yield strength of the material causing a failure. Below this point, the defect may contain enough structural support around it thus eliminating the danger of a rupture.

TABLE 1

Repair Number	Description of Repair
1	Pit was circular 1 inch diameter x 0.220 inch deep, on outside wall, welded and ground flush.
2	Pit was elliptical $1\frac{28}{32}$ inch x $1\frac{11}{32}$ inch x 0.281 inch deep on outside wall, welded and ground flush.
3	Pit was elliptical $1\frac{20}{32}$ inch x $1\frac{13}{32}$ inch x 0.305 inch deep, on outside wall, welded and ground flush.

TABLE 2—Strain-Gage Data Points

Reading No.	Pressure	Pct Minimum Yield
1	0	0
2	344	30
3	459	40
4	574	50
5	826	72
6	1034	90
7	1148	100

TABLE 3

Repair Number	Description of Repair
1	Pit was rectangular $2\frac{29}{32}$ inch x $4\frac{14}{32}$ inch x 0.125 inch deep, on outside wall, welded and ground flush.
2	Pit was circular $\frac{13}{32}$ inch diameter x 0.005 inch deep, on outside wall, welded and ground flush.
3	Pit was elliptical 1 inch x $\frac{25}{32}$ inch x 0.325 inch deep, on outside wall, welded and ground flush (this was a pinhole leak).

Test Procedure. The tests were made on 30-inch OD x .325-inch 5LX52 line pipe. Three separate tests were run on three different lengths with welded repairs being made on two joints. The third joint was subjected to a hydrostatic test without any repairs. This pipe had been in service for nine years and was replaced due to excessive corrosion. All of the defects on the three test joints were natural corrosion pits.

A. Test on Joint No. 1. This joint contained three corrosion defects on it as described in Table 1.

The welding was done with 5/32-inch low hydrogen type electrode. Sufficient weld metal was deposited so that after grinding the area smooth, no notches were left on the edges due to undercut or bead shapes. The grinding was done in a manner that would as nearly as possible restore the original contour of the pipe wall.

SR-4 strain gages were applied to the repaired areas in an attempt to obtain information with regard to the individual stresses occurring in each area. The gages were of the single element type placed so as to give the strain in a circumferential direction. A gage was placed on a sound portion of the pipe for comparison purposes. Water pressure was increased in increments as shown in

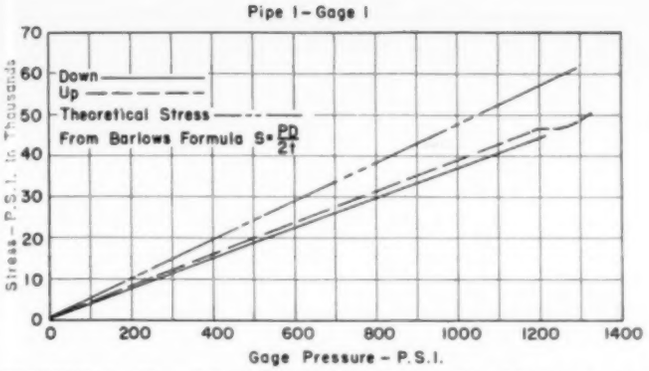


FIGURE 4—Test Joint No. 1, Gage No. 1. In this test procedure, pressure was first elevated to allow the strain gage to take its initial set. Readings were then taken as pressure was released. These are labeled "Down." Next, pressure was raised again for additional readings. The pit was circular, one inch in diameter and 0.220 inch deep before repairs.

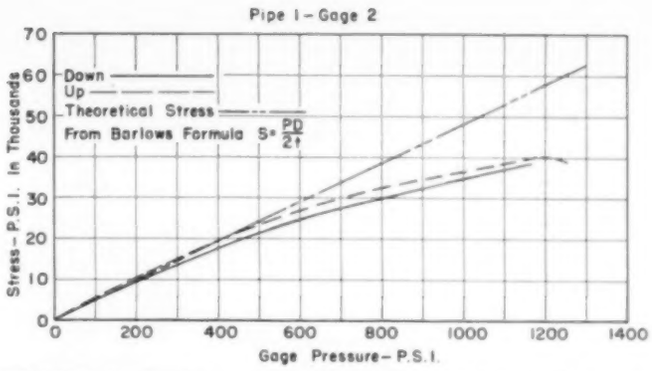


FIGURE 5—Strain gage readings from Gage No. 2, Test Joint No. 1. The pit was elliptical measuring 1-23/32 inches by 1-11/32 inches. It was 0.281 inch deep. Wall thickness of the pit before repair was 0.050 inch. After repair, 0.331 inch.

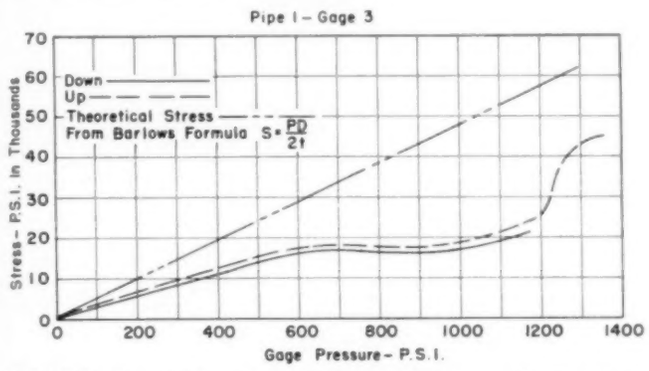


FIGURE 6—Strain gage readings taken from Gage No. 3, Test Joint No. 1. The pit was elliptical in shape measuring 1-20/32 inches by 1-12/32 inches. It was 0.305 inch deep. Wall thickness before repair, 0.026 inch. After repair, 0.331 inch.

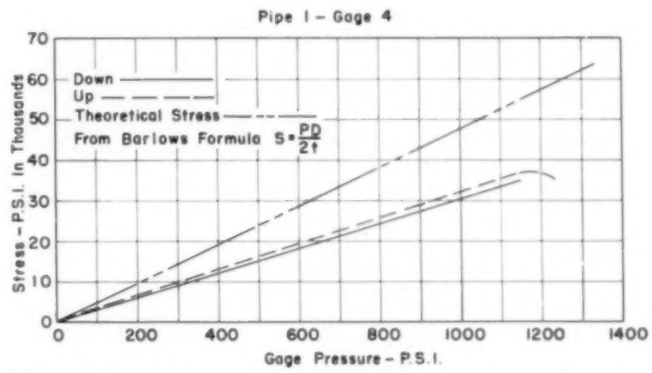


FIGURE 7—Strain gage readings from Gage No. 4, Test Joint No. 1 This gage was located at an area where there was no defect and the pipe had an original thickness of 0.331 inch.

Table 2 with strain readings taken at each increment. The pressure was then lowered in the same increments with strain readings being taken and then back up again to the yield point. Sufficient water was induced to produce a 0.2 percent volumetric offset which by definition is the yield point. The yield point on this joint was found to be 1500 psi.

Tests on Joint No. 2. This joint contained three corrosion defects on it as described in Table 3.

The procedure for this test was carried out the same as that on Test Joint No. 1. The Defect No. 3 was complete penetration of the wall and in order to coincide with field conditions on line in service, the repair was made by welding from the outside only. The yield point of the test joint was found to be 1,545 psi.

Test on Joint No. 3. This joint contained 10 corrosion defects on the outside of the pipe. They are rescribed in Table 4.

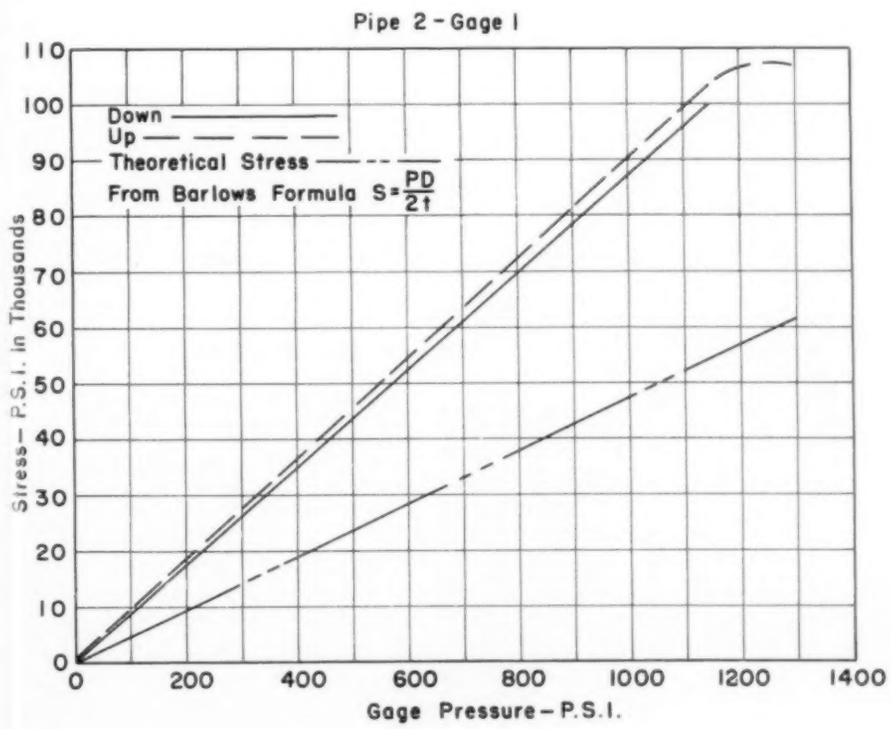


FIGURE 8—Strain gage readings taken from Gage No. 1, Test Joint No. 2. The rectangular pit measured 2-29/32 inches by 4-14/32 inches. It was 0.125 inch deep. The wall thickness of the pit area was 0.206 before repairs and 0.331 after repairs.

TABLE 4

Defect Number	Description
1	Elliptical Pit $1\frac{24}{32}$ inch x $\frac{29}{32}$ inch x 0.100 inch deep on outside wall.
2	Elliptical Pit $2\frac{4}{32}$ inch x 1 inch x 0.175 inch deep, on outside wall.
3	Circular Pit $\frac{12}{32}$ inch diameter x 0.063 inch deep, outside wall.
4	Elliptical Pit $1\frac{16}{32}$ inch x $1\frac{5}{32}$ inch x 0.157 inch deep, outside wall.
5	Elliptical Pit $\frac{19}{32}$ inch x $\frac{24}{32}$ inch x 0.038 inch deep, outside wall.
6	Circular Pit $1\frac{12}{32}$ inch diameter x 0.160 inch deep, outside wall.
7	Circular Pit $\frac{28}{32}$ inch x 0.206 inch deep, outside wall.
8	Elliptical Pit $\frac{12}{32}$ inch x $\frac{24}{32}$ inch x 0.100 inch deep, outside wall.
9	Elliptical Pit $2\frac{28}{32}$ inch x $\frac{12}{32}$ inch x 0.102 inch deep, outside wall.
10	Circular Pit $\frac{24}{32}$ inch diameter x 0.037 inch deep, outside wall.

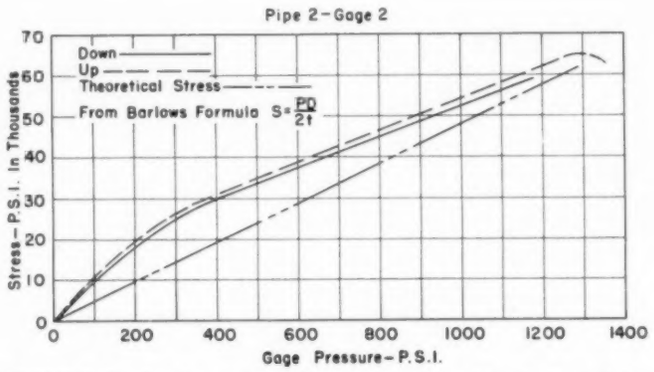


FIGURE 9—Strain gage readings from Gage No. 2, Test Joint No. 2. The circular pit was 8/32 x 12/32 x 0.005 inch deep. Wall thickness before repair, 0.326 inch. After repair, 0.331 inch.

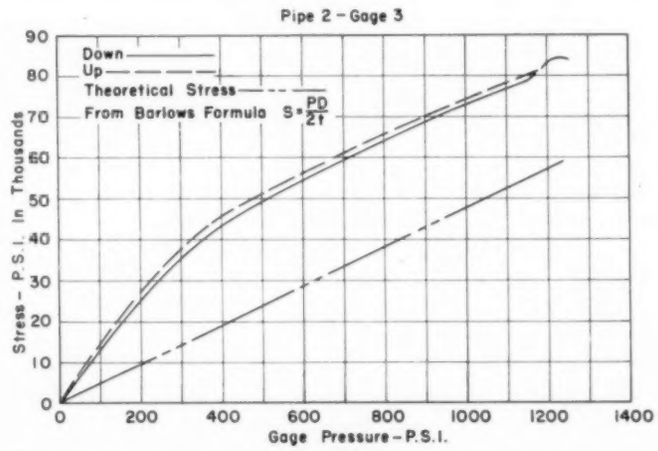


FIGURE 10—Readings from Strain Gage No. 3, Test Joint No. 2. The elliptical pit measured 1 x 28/32 x 0.323 inch. Wall thickness before repair, 0.008 inch. After repair, 0.331 inch.

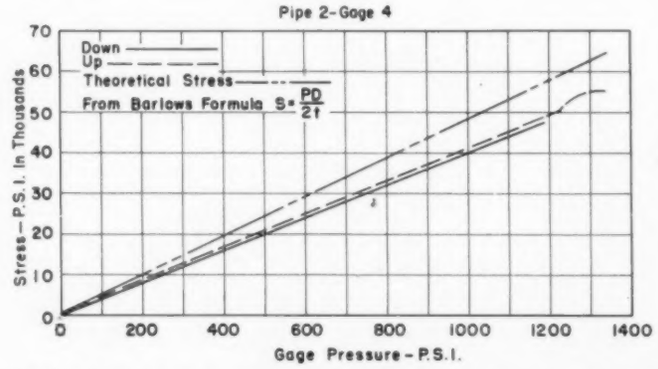


FIGURE 11—Strain gage readings from Gage No. 4, Test Joint No. 2. in an area where there was no defect and no repair. Wall thickness was 0.331 inch.

This joint was tested without making any repairs to the defective areas, for two reasons. First, to determine whether or not there was any correlation with the repaired sections as the defects were all of the same type, and secondly to see if the theoretical yield point was reduced by these defects. A hydrostatic test was applied with the pressure being raised until the pipe yielded. The yield point on this joint was found to be 1350 psi.

The test indicated two interesting points: The theoretical yield point of the pipe was not reduced by the welded repairs to these sizes of defects, and the yield point was not reduced by the defect itself without any repairs. The results of the strain gage data have been plotted and are shown. These data show that the stresses of the repaired areas follow very closely the stress taken on a portion of sound pipe where no repair was made.

Gages 1 and 3 on Test Joint No. 2 show stresses above the theoretical stress. These two areas are the ones with large area and complete penetration. More welding would naturally be required to complete a repair. The indications are that this increased stress is welding stresses. However, sufficient information is not available to evaluate the true level of welding stress. The combination of welding stress with stress due to internal pressure may reach a point where local yielding will take place. It is important that the repair be made in such a way as to eliminate any notch and be ductile enough to allow this local yielding without initiating a failure.

It is well to note here that, with the exception of Repair No. 2 on Test Joint No. 2, the repairs were made on defects beyond the allowable as specified by the manufacturing specifications, yet they all performed satisfactorily under the testing as required by these specifications. The Test Joint No. 3 without any repairs was also carried out satisfactorily and further study should be made to arrive at a scale to show what size defect both in over-all area and depth actually does decrease the yield strength of the pipe. Further investigation should be designed to determine more in detail what effect repeated cycles of stressing without exceeding the theoretical minimum yield would have on welded repaired areas.

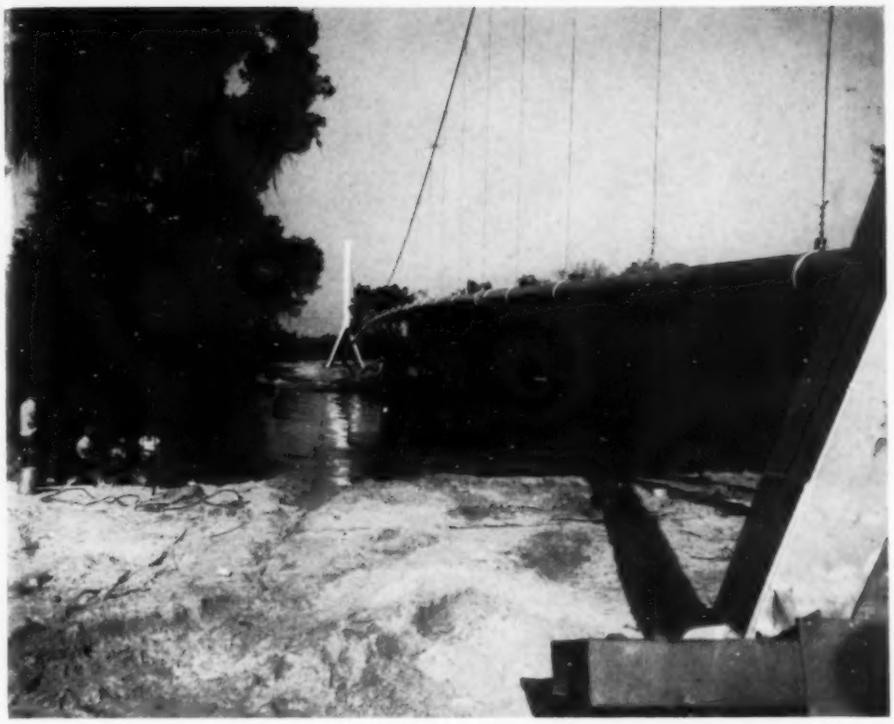
Based on these tests along with past research, it is believed that welded repairs can be made satisfactorily to a much greater degree than is presently allowed if the proper repair procedure is used.

ACKNOWLEDGMENT

From a paper originally presented at the 14th Annual Petroleum Mechanical Engineering National Conference of the American Society of Mechanical Engineers, Houston, Sept. 20-23, 1959.

About the Author

Tyler A. Ferguson has been with Transcontinental Gas Pipe Line Corporation for 10 years. He was first a progress engineer on construction, in 1950 he was made division engineer in Atlanta and in 1953 he was promoted to pipe line district superintendent. In 1958 he advanced to his present job of senior welding engineer. A registered professional engineer, Ferguson was graduated from Texas Technological College in 1949 with a degree in petroleum engineering.



Tower on bridge across the historic Suwannee River looks like a finger of light pointed toward the sky. This bridge was erected in about one hour's time. All parts, even the cable system, were prefabricated in Houston and shipped to crossing site.

New Type Aerial Bridges On Houston Texas System

These easily erected prefab bridges bring new economies to pipe line construction

By Weldon F. Appelt and McCall Fitzpatrick
Clear Span Engineering Co.
Houston

OFTEN, THE MARK of good engineering is symmetry and beauty. Such is true in the case of a new type prefabricated aerial pipe line bridge which was erected across five streams on the Houston Texas Gas and Oil Corporation system which runs from Louisiana to Florida.

Each of the new bridges spans a river with a 24-inch pipe line—yet despite this sizeable load, spans were constructed in just a few working days. Actual erection takes only an hour or so.

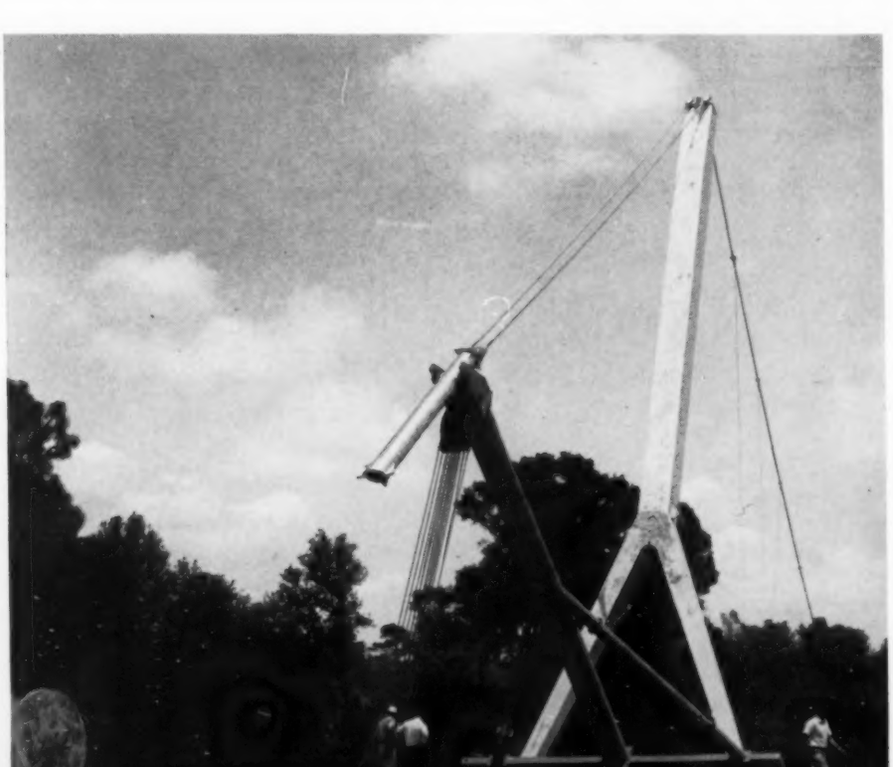
These bridges which bring new economies to pipe lines are shop made, then shipped to the job site for erection. Pipe for the crossing is welded up on shore, attached to a cable system. Meanwhile, the towers which come to the job in 40-foot sections are welded together face down and pinned to their foundations. The pipe and cable system is floated across the river, attached to the tops of the two towers.

When the two inverted "Y" shaped towers are pulled in an operation that takes just about as long to complete as it does to drive home from work in an average city, the entire span—pipe, wire rope system—rise into permanent position above the water.

New Tower Design. These five new spans make a total of 20 such bridges constructed in the U.S. Earlier bridges differed from these primarily in tower

Tower is assembled face down on the job. Made of box-girders and shipped to the job in 40-foot sections, only a few welds are necessary for assembly.

A diagonal strut is attached to the horizontal tower in preparation for erection. At this point, the 24-inch pipe line with the cable system attached to it has been floated across the slow-moving Suwannee. Note the multisheave block connecting a pad-eye on the foundation at left with the construction strut.



Down comes the strut, up goes the tower, pivoting on pins on the foundation. As the second tower reaches its final upright position, the pipe assumes the proper camber across the span of the river.

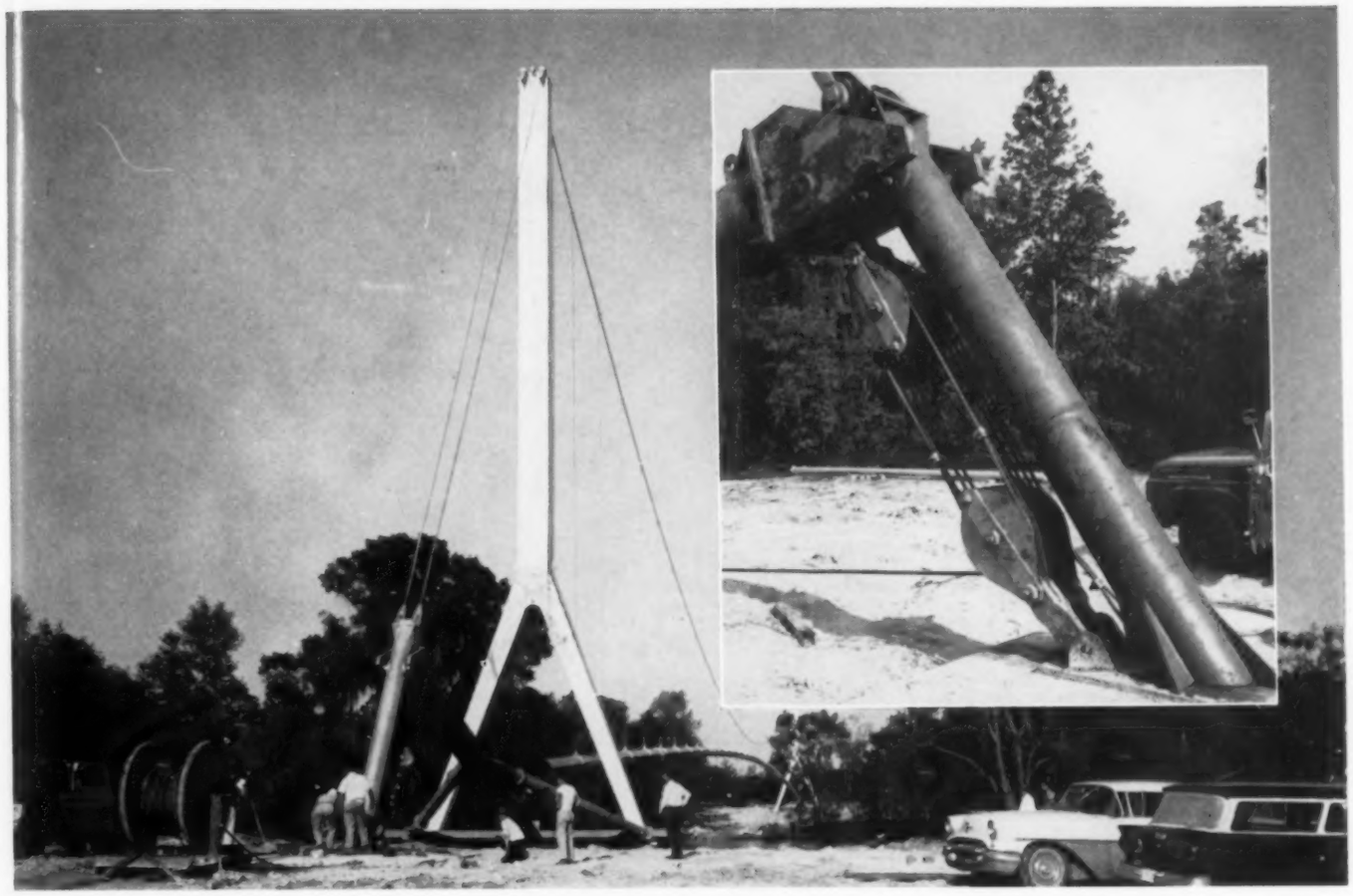
design. The towers were tripods made of pipe, and once erected, welded in place.

The new towers are box girders with an outer skin of 5/16- to ½-inch steel plate and hermetically sealed internal bracing. These girders are patterned after those used by our engineers in highway and oil field bridge designs. On a per weight basis, they are perhaps the most efficient structural members in the entire field of bridge design. Best known of the bridges constructed from them is the International Bridge that connects Laredo, Texas, with Mexico. This bridge is noted for its long span with no truss-work.

The towers were shop fabricated in Houston, shipped in 40-foot lengths to the various crossing sites where the four or six sections which comprise each tower were welded together. They were assembled face down with the apex pointing in toward the river. The hinged bottoms were pinned to the foundations, and the towers were ready for erection.

Wire Rope System. Meanwhile, the preassembled cable system was attached to the 24-inch crossing pipe line. This system is designed so the final posture of the overhead cables will be a modified parabolic curve, rather than the conventional catenary. The catenary calculations assume a uniform load along the cable sag, introducing errors equal to the ratio of the angle of the cable to the horizontal at any specific point, according to the designers. In most cases, the sag will be 1 foot for every 10 feet of span—however, design engineers have used curves as shallow as 1 foot to 14 feet of span where tower height was limited.

Wind Cable System. On this bridge design, wind cables are nothing more than tie-backs to special anchors or to the main tower rear anchor via spreaders. This eliminates a tedious, expensive and difficult to install catenary system which by its very nature can be the cause of undesirable harmonics. Wind loading problem on pipe line bridges has been considerably exaggerated. The lateral loads are minor for the most part. As a

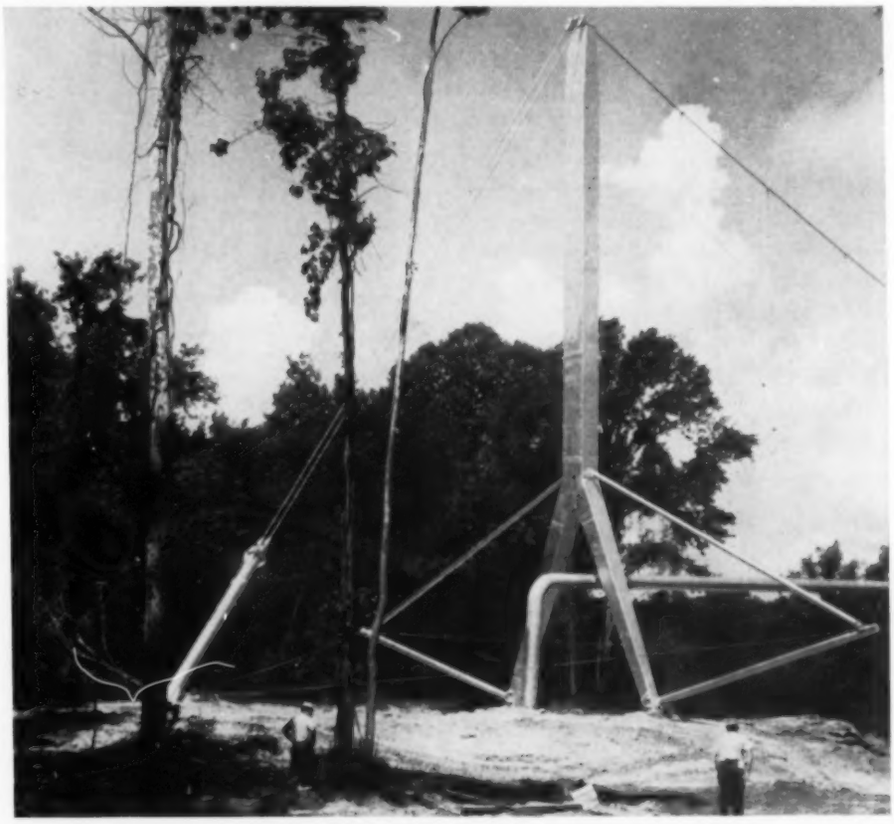


The tower is up, the Suwannee is spanned. Note the camber of the pipe. At this point, the remaining jobs are to remove the construction strut, weld the anchor piece to the foundation and tie in the pipe line on either side of the river. Inset shows a close-up of the blocks and the anchor piece which will be welded to the bearing plate on the foundation.

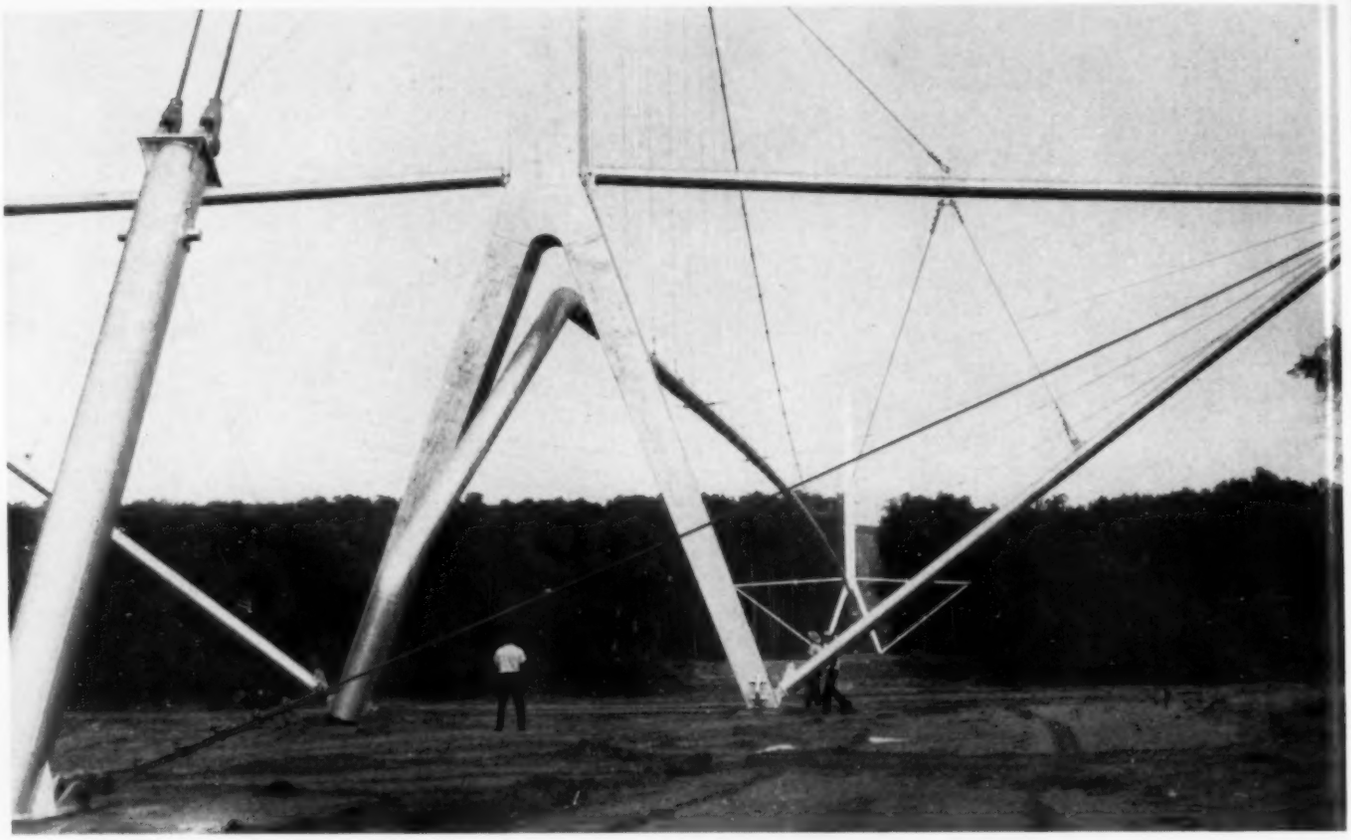
case in point, one of the bridges of similar design has weathered the force of two hurricanes without damage.

Foundations. The foundations are unique, to a degree resembling a tree root system rather than a conventional installation. They are light, square or rectangular, and from each corner springs a diagonal which bites into the earth like a root on a tree. There are two advantages to these foundations. First they weigh less, and are thus able to support more. Old type massive concrete foundations are often 15 times the weight of the imposed loads. Second, the spread footings resist overturning moments far better than conventional foundations in proportion to their weight. Too, they are designed for high flexibility; they can be used with piling, etc.

Line Construction. The pipe line which is to span a stream is simply welded together, tested and painted. It is then attached to the cable system and floated across the stream.



The completed tower! Note the wide braces which act as spreaders for the wind ties which have been added. Design engineers say that the so-called wind cables are not necessary. As proof, they point out that one bridge of this type has withstood two hurricanes without damage.



The 1,000-foot span across the Apalachicola River in Florida. Note that the wind tie cables are attached to the foundation at the left.

Field Assembly. After the towers have been welded up and pinned to the foundations, the pipe and cable system floated across the water, then the towers and the main overhead cables are joined. A heavy strut is attached to the inverted "Y" tower as shown in the accompanying photographs. Through two multisheave blocks, a single tractor can hoist each tower erect.

As each tower comes to proper position, the back stay is welded to the foundation block. Through accurate prefabricating methods, the pipe line in most instances will assume proper camber once the towers are aloft.

Length of Span. On the Houston Texas Gas and Oil system, the length of span varied from 520 to 1000 feet. They cross the following rivers:

Pearl River—520 feet,
Escambia River—640 feet,
Pascagoula River—660 feet,
Suwannee River—660 feet and
Apalachicola River—1000 feet.

The company has constructed longer crossings—one across the Clark Fork of the Columbia River in Montana is 1220 feet, and a crossing of the Chesapeake-Delaware Canal is 1340 feet. However, these latest bridges support the largest diameter lines thus far.

Advantages of the Aerial Spans. These low cost bridges which lift the pipe above the flood stages of the rivers they cross have a number of advantages. First, they are not subject to scour or flood damage; their cost in many instances is less than the cost of submarine construction; and they can be installed quickly enough to take care of emergencies if necessary.

Another advantage of the new type box girder tower—it will enable engineers to tackle spans in the range of 3000 feet, which brings the Mississippi River into focus.

ACKNOWLEDGMENT

Jess Matthews and Jerry Stubbs of Mid-Western Contractors, Wheaton, Ill., had charge of the erection of the bridges.

Notes On Future Design Of Aerial Suspension Bridges

THE MOST DIFFICULT problem confronting any engineer who strays from the beaten paths in design is not the limitations imposed on him by strength or costs of material—it is finding acceptance for his innovation in the industry to which it is related. Any new idea will draw objections like molasses draws flies. Many of these objections are simply rooted in prejudice against change. Others stem from makers of competitive products. Actually, there are advantages to this reluctance to accept change. First, it puts a new product through the wringer so-to-speak; and if the product is good, it may materially aid in its improvement. Six years ago, Clear

Span Engineering Co. designed and installed aerial suspension bridges of a new design for Yellowstone Pipe Line Company. These bridges, which crosses the Clark Fork of the Columbia River in Montana in seven places, were supported by pipe tripods located on either side of the streams. Their design permitted quick erection—(page 98, July 1954, PIPE LINE INDUSTRY) one 1,220-foot span was raised in one hour. But these economies in weight, construction costs, etc., actually led a number of engineers to class the bridge as "too flimsy." Despite calculations, they predicted the structures would not withstand wind and ice loads and thermal stresses.

Six years—and 20 bridges later—it is much easier to evaluate the design. One of the bridges on the East Coast has weathered two hurricanes without damage. The bridges in Montana have been subjected to ice and wind loads, and the temperature differentials have been as severe as expected. The bridges have not failed.

As a result, most objections to aerial bridges now belong in the category of borrowed trouble. They center on the foundations of the towers which support the main cable. The possibility that water may destroy the towers at flood stage of the stream crops up most frequently today. Is this a valid objection? Let's take a close look at this problem:

Obviously, the problem of tower location is the very first consideration of the designer. In order to maintain a reasonable span, towers on wide river crossings must necessarily be located in areas that are likely to be inundated periodically.

These areas usually lie outside the actual river waterway bank, where flooding occurs occasionally with water depths varying from 1 foot to 25 feet. In the Mississippi River Basin, these areas lie between a flood levee and the river bank.

In most instances a span of 2,000 to 2,500 feet will very satisfactorily take care of crossing the Mississippi on a bank-to-bank basis; but a span of 5,000 to 6,000 feet is required for crossing on a levee-to-levee basis. The levee-to-levee span length is prohibitive, economically and structurally. *The bank-to-bank crossing is very sound, economically and structurally.*

Evidence of the truth of this statement is borne out by a study of hundreds of bridge installations in the Western Hemisphere and thousands of piers, columns and other structures attached to foundations within river flood areas. *In not one instance has there been a failure due to flood action against the side of a column or pier.*

This should be particularly important to pipe liners because there are many known underwater crossing failures.

Highway Bridge Failure. On several highway or railroad bridges, the piers have broken off because flood waters rose to a height sufficient to lodge debris under the bridge deck and then float the whole superstructure up and off the foundation. This condition will not be possible with a modern aerial pipe line crossing because the elevation of the line pipe is always placed *well above* the top elevation of the levee.

Single column structures, with no cross bracing parallel to forces imposed by the flood current, show hardly any effect from flood waters. One need only fly over the Mississippi River Basin to see thousands of examples illustrating this fact.

Early practice often incorporated so much dead weight into the footing structure that this alone contributed a greater hazard to pier failure and overturning than any live or lateral load expected to be imposed on the piers. Today, the best engineering practice calls for footing installations as light as possible. This allows a maximum amount of soil bearing capacity for support of superstructure and live loads. By securing better and more reliable soil tests and designing wider spread footings we are able to predict more accurately and consistently the effect of expected loads on the piers. Wherever there is a reasonable possibility of the entire river bank scouring out from around the pier, the design calls for piling supports which extend far below any point of scour which may occur before repair and protective maintenance can be installed.

One of the world-famous authorities on scour and flood effects of rivers has pointed out that installation of towers for aerial suspension bridges right on the main river bank within levees ordinarily offers little hazard. Stabilization of a river bank area which is normally out of the water has come to be a very simple task. Planting grass, placement of stones and other revetment structures, has proved to be absolutely dependable and satisfactory. But even more important, it is possible to not only retain the original bank soil, it is also possible to install baffles and deflectors which slow down flood water velocities around the pier and thereby cause a build-up deposit with each flooding of the pier area. We can also design the shape of the projecting concrete pier pedestal to obtain the same result.

Once again we want to cover the following point—there just hasn't been a failure of a pier on a river bank floodway area where the pier installation has been properly designed and installed. Doing this properly is a job that falls within the capability of any good engineer and recognition of this fact is also the responsibility of a good engineer. Why is so much concern evidenced over something that has not happened and something which present day engineering practice does and will prevent? —**The End**

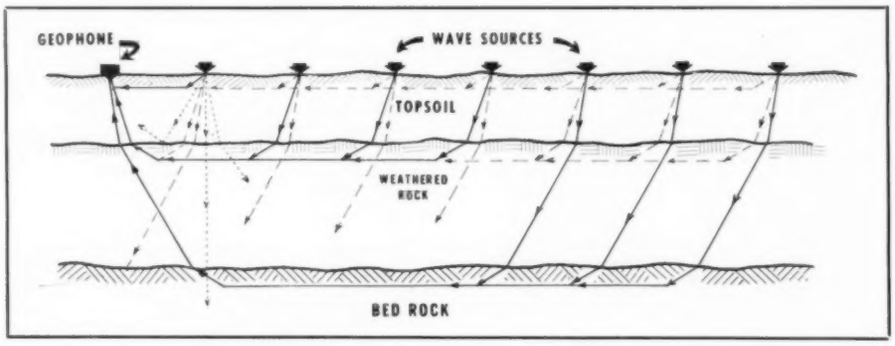
About the Authors

Appelt **Fitzpatrick**

Weldon F. Appelt, founder and president of Clear Span Engineering Co. is an engineering graduate of Texas A&M College. Many of his original design concepts for pipe line bridges have been incorporated in crossings throughout the United States. Such innovations include maximum stability footings, suspension systems and tilt-up truss towers. Other unusual engineering projects designed by Appelt are a covered stadium and exhibition hall to seat over 100,000 people, an ocean mobile with 40-foot diameter wheels for offshore pipe laying, a monorail system and an "inverted underwater pipe line bridge" to span deep, wide bodies of water.

McCall Fitzpatrick is a graduate of The University of Texas. He is vice president and director of engineering for Clear Span. He also is a consulting architect and has done considerable research in the field of suspension structures and other phases of architecture and engineering.

Subsurface analysis starts with the strike of the hammer against a steel plate on the ground. The shock wave travels underground to the geophone and on to the electronic counter. Distance can be measured from the plate to the geophone, and time measured by the counter. Depth of rock and its hardness is found by comparing readings with velocity tables.



Operation of the seismic analysis equipment is shown schematically in this diagram. Seismic waves are created at the arrows, starting at a point 10 feet from the geophone and moving out 10 feet at a time to 100 feet. At 10 feet, the wave near the surface is first to reach the geophone. From 20 to 40 feet, the wave traveling through the denser weathered rock reaches the geophone before the waves traveling through the less dense topsoil of the deeper bed rock. Beyond 40 feet, the waves traveling through the bed rock are the first to reach the geophone. Although these waves travel farther, they move faster.

New $3,000 Instrument Locates Buried Rock

How MUCH ROCK lies hidden below the surface of the ground? What kind of rock is it? Can it be ripped or must it be blasted?

A tractor company's engineers have devised a means of answering these questions—inexpensively! A $3,000 seismograph instrument which can be operated by inexperienced personnel with only an hour's instruction, not only tells the depth of various strata of rock below the surface of the ground, it tells whether the rock will yield to powerful rippers or must be blasted. This new unit should effect sizeable reductions in the cost of ditching!

In the past, answers to the questions above had to be literally unearthed! Workmen had to dig or probe down to the rock, core it with light drilling units. All of these methods were expensive and they left much to be estimated.

Bad estimates—as to the amount of rock or its hardness—have caused many contractors to lose money. In the past, many a contractor has watched profits fade away amid the blast of high explosives and the clank of shovels, only to learn as the work progressed that he could have handled the rock with ease at one-third the cost—by ripping instead of blasting!

When rock is blasted, the overburden must be scraped off, holes must be drilled, loaded and shot; and shovels must remove the rock spoil from the ditch. This is expensive, and many unexpected difficulties can cause contractors to have nightmares.

No longer is blasting the only practical way to move hard or rocky materials. Development of powerful tractors during recent years has changed this picture, paving the way for application of rippers for shattering and loosening tough materials to speed scraper loading. This new tool is so effective that its use is definitely on the upswing.

Contractors learned that virtually any material could be ripped if conditions were right. The key to "rippability" seems to be consolidation of material. Even granite can be ripped if it has been weathered or fractured.

Until now, contractors had no economical way to determine this factor of "rippability." All they could do was to try ripping; but how many contractors could afford to invest in a $55,000 machine on the chance that it might work? No wonder engineers displayed such interest in finding a fast, inexpensive and accurate way to determine *if* the material could be ripped before a tractor and ripper was moved in.

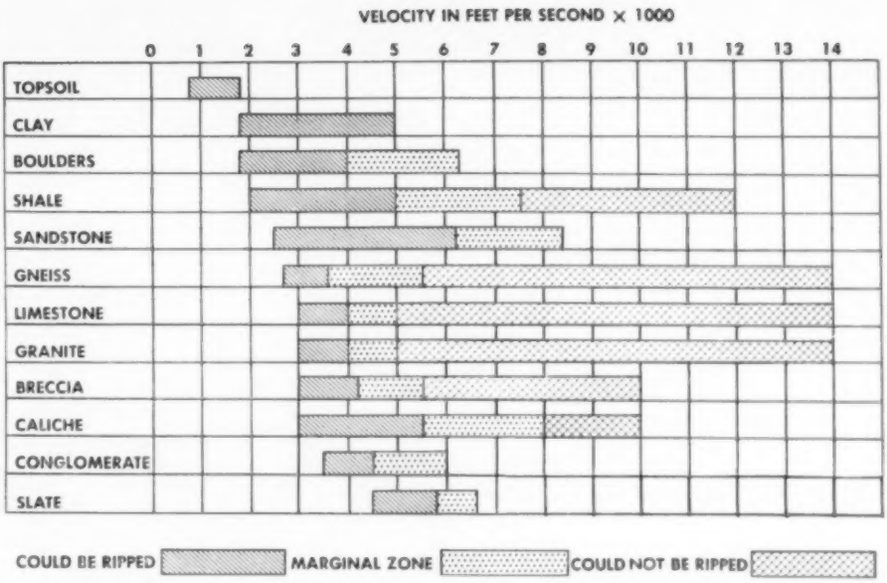
Now backed by more than 500 tests of the new instrument, the accompanying chart relates seismic wave velocity to ripper performance.

How the seismograph works. Seismic analysis is simple in theory—sound waves travel through materials of different consolidations at different, predictable velocities. The velocity of a shock wave traveling through subsurface clay is many times slower than the same wave traveling through rock.

Equipment needed for seismic analysis includes a source of a wave, a receiver, an electronic counter and a set of tables.

The sound or shock wave can be produced by several methods. In oil field work, dynamite is usually used. This can give readings down to more than 25,000 feet. Such depth is not needed to check a ditch cut. In addition, even a small blast should not be used in many areas due to proximity of men and machines or populated areas. For the purpose of this study an 8-pound sledge striking a 6 x 6 x 1 inch thick steel plate produces an adequately sharp wave, strong enough to provide readings to depths of 50 feet.

The receiver is a standard geophone—a moving coil in a silicone fluid, resting on a base. A flat base geophone, which sets on top of the ground, is used if the surface is hard. A cone-shaped base can be pressed into the ground for better pickup in loose soils.



To determine if a subsurface material is rippable, a tractor company's engineers have compiled tables such as this on 12 common materials. The breakover point on wave velocity between rippable and non-rippable varies for each type of material. Separate tables must be compiled for each size of ripper.

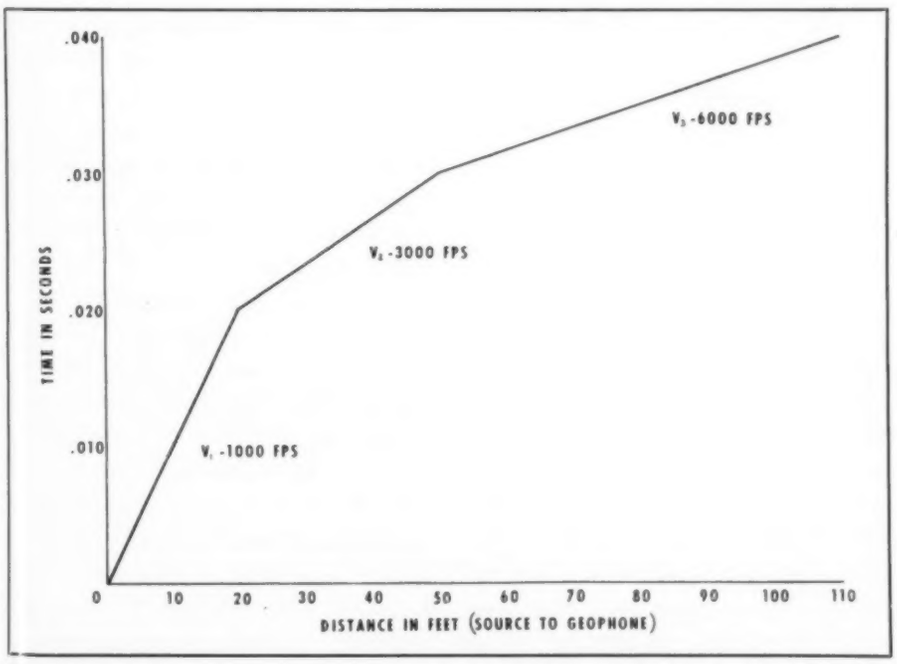
An electronic counter determines the time interval between the strike of the hammer and the arrival of the seismic wave at the geophone.

The equipment is lightweight, simple to operate, and accurate. All together it weighs about 40 pounds, and can be operated easily by two men. As a rule contractor's personnel can learn to operate this equipment in less than an hour, following directions furnished by the manufacturer. (The seismograph, including self-contained batteries, costs less than $3,000.) Working with the equipment for a day or two under known conditions will quickly develop reliable accuracy of operation.

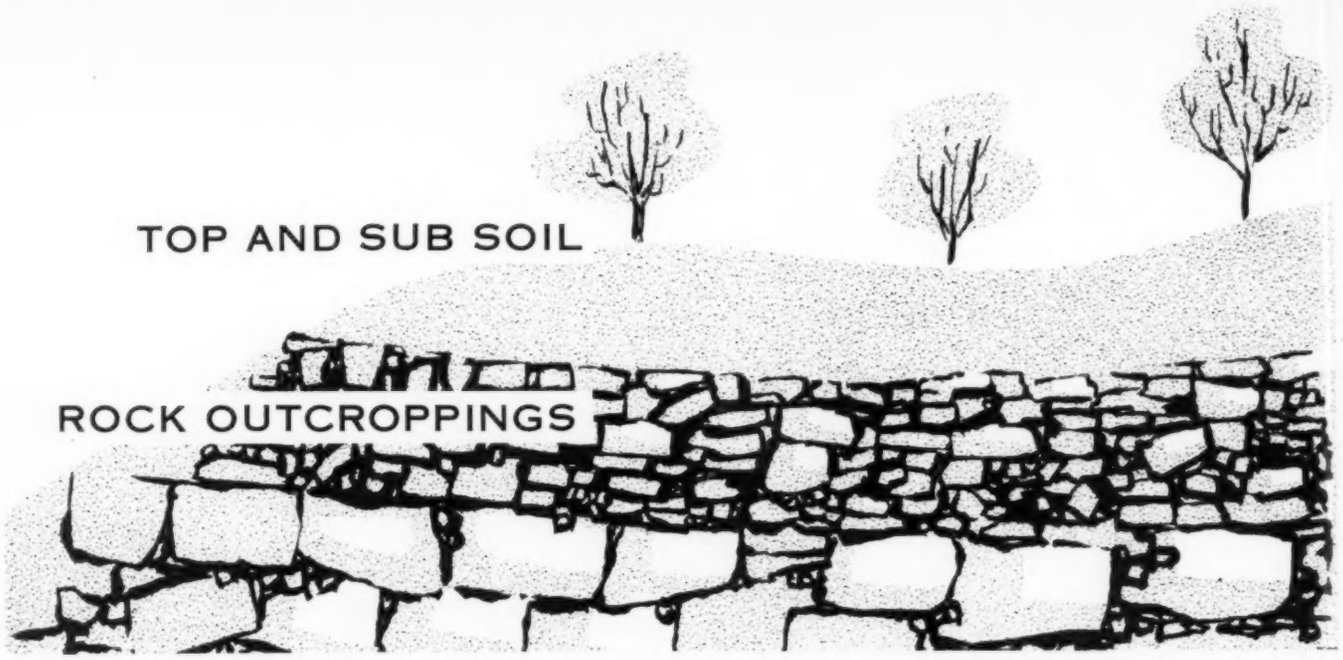
Operating procedure is simple. The electronic counter, housed in a small metal container about the size of an overnight case, operates on self-contained batteries. A geophone plugs into one receptacle on the counter's face. A long wire goes into another receptacle and the other end of the wire connects to a spring contact switch on the sledge. A small steel plate, when hit by the sledge, will produce a sufficiently strong wave for readings to 50 feet deep under most soil conditions. Blasting caps wrapped in a couple feet of primacord may be used if stronger waves are needed.

When the sledge strikes the plate, shock waves are sent through the ground and the switch closes, starting the counter. When the first wave reaches the counter through the geophone, it stops the counter. Time is recorded in milliseconds by flashing lights. The first check is made at 5 or 10 feet from the geophone, and successive checks in a line from the geophone in 5 or 10-foot steps, depending on soil and job conditions.

A complete test on a cut can be run in less than 30 minutes. Velocity



Time and distance are plotted on a graph, with distance in units of feet along the bottom and time in units of milliseconds along the side. Straight lines are drawn through adjacent points. X_c (see formula in text) is the distance from zero feet to the point of intersection of the lines. Each material will have its own slope.



Seismic analysis of a section of the 24-inch pipe line right-of-way near Manhattan, Kan., showed deep top and subsoil on top of the hills and rock on the slopes. Velocities of seismic waves indicated all of the material could be ripped ahead of the ditchers.

(V) of the wave is found by the formula.

$$V = \frac{D}{T}$$

where D is the distance from the plate to the geophone and T is the time lapse. This is plotted on a graph, with distance in feet along the bottom and time in milliseconds up the side. Points fall in line for each type of material since velocities are the same for similar consolidations. Intersection of straight lines through adjacent points indicates changes in consolidation.

Depth at which these changes occur is computed by the formula

$$D = \frac{X}{2} \quad \frac{V2-V1}{V2+V1}$$

where D is depth, X is the distance along the bottom of the graph from zero to the intersection point of the lines; V1 is the velocity of the seismic wave in the upper layer; and V2 is the velocity in the next lower layer. Depths of successive layers are determined in similar fashion.

Accuracy has been established by running tests under known conditions and by checking ripper performance after tests. A well-known tractor company and many of its dealers have this equipment and conduct tests for contractors after the contracts have been awarded. More than 50 contractors own this equipment, using it to determine subsurface conditions before bidding and equipment scheduling.

Case History. On one highway project in Michigan's upper peninsula and another in the hills of southeastern Kentucky, contractors were planning to drill and blast. Seismic analysis showed large quantities of the rock could be ripped and handled by scrapers, at considerable reduction in cost per yard. Both contractors moved in two tractors with mounted rippers, based on these findings. The savings was sizeable.

The large number of tests have been amassed into a set of tables. Rippable and non-rippable velocities have been determined for each type of soil. In almost every case, a zone of marginal material divides these two categories. Rippability within this zone depends on soil conditions, machine condition and skill of the operator. Consequently each contractor must determine rippability within this zone. Many times he can almost completely eliminate it through experience.

Satisfactory results cannot be obtained when the surface is frozen. This ground is so consolidated that the surface wave almost always reaches the counter ahead of the subsurface wave, regardless of the density of these lower layers. Likewise, seismic analysis will not reveal the presence of softer materials below harder layers, such as in cap rock areas.

Several contractors have found completely unrelated uses for their equipment. One knew he had sandy clay as deep as he could go, but wondered how deep the water table was. Seismic velocities jumped when they hit waterbearing strata, pinpointing the water table.

Ripping is not considered a cure-all to every rock-handling problem. A contractor must weigh many considerations in deciding what method to use for a particular case. Factors are the type of equipment already on the job, availability of special tools, proximity of structures and populated areas, acceptable production rates, local regulations, relative costs per yard and insurance rates. But seismic analysis is showing the way to lower costs through ripping on many jobs.

—The End

Which Man Should You Promote?

Here are some of the points you should take into consideration when faced with that tough decision of which man to promote

By Ernest W. Fair

SOMETIMES AVAILABLE promotions are obvious but more often the choice involves some detailed considerations where a number of apparently equal employes are available. Making certain that the right man is promoted is more essential than ever before as no executive or superintendent can ever afford to overlook meritorious individuals. There are just not enough good men available to risk uncertainties in making such a selection.

Here, from careful study of selection methods used by more than a score of executives, are the major considerations which may well be applied to such individuals in determination of who shall receive each such promotion.

These, plus others pertinent to the individual job, can be listed in a "rating chart" which will always make such selection easier and give us greater assurance we are always picking the right individual for the job.

1. Consistent. Does he keep the quality of his work exceptionally high every working day? When promotions are in the offing, many workers will suddenly become very quality conscious. What each individual has done in the past as well as his present work performance must be taken into account. The man whose more recent performance is unusual will in all likelihood drop back into old routines once the promotion has been obtained. The one who keeps standards high as a matter of work routine will carry through into the new job.

2. Reporting. Can he report in clear and understandable terms? This is a basic requirement of good job performance in almost every case for the new job invariably calls for considerable reporting of both an oral and written nature. If no such work has been done by the individual in the past, some tests should be made at this time.

3. Continued Improvement. Is he continuously improving his own knowledge of the work? The man who will be worth anything in the new job can seldom be one who depends solely on his present knowledge to get the job done. Chances are, promotion involves a job of semi-executive status which will require constant improvement in performance.

4. Resourceful. Does he know what to do in out-of-routine situations without being given detailed instructions? The individual who lacks the ability to handle such problems can hardly be expected to suddenly acquire techniques for dealing with them. Out-of-routine situations occur with great frequency in pipe line operations all the way down the line. How well each man has handled these when confronted with them in past work posts is a valuable indicator to his abilities for better spots on the refinery staff.

5. Leader. Can he stimulate the work of others around him? Some of us by second nature have this valuable trait. Others, no matter how much they pressure themselves, can never acquire it. It is invariably apparent in any employe's day-to-day working habits. It is most necessary in any "better job" to which he may be possibly assigned through promotion.

6. Steady. Is he the type of worker who never shirks the unpleasant parts of job and takes them in stride? The higher a man goes in any organization, the greater number of unpleasant tasks will arise. Therefore, he must have the ability to handle the small problems in his present job before there is any possibility of his being able to tackle them in a new position.

7. Keep Records. Can he keep minor records essential to the new job? Here again some sort of test of an individual's ability along these lines may be necessary as record keeping is seldom a part of most basic jobs. It will, in small or large measure, very likely be a part of the new job. We can hardly take a chance on promoting a man who is incapable of handling this phase of the new job, so if experience is lacking, tests are definitely in order.

8. Handles Routine. Does he handle job routines with a minimum of effort? This is another trait of utmost importance as the individual rises higher on the staff, for his effectiveness may largely depend on his ability to quickly and efficiently handle all routines for the new job. More and more of his workday time will be needed to handle new tasks, so the less needed to accomplish standard routines, the more capable such an individual can be.

9. Maximum Effort. Has he always tried to do just a little more than his job called for? Finding such an individual on the staff in these days is never easy yet it is a factor of extreme importance. The man who does no more than required to hold onto his job, even though handled with efficiency, is not exactly a prime choice for a better job where any unwillingness to put forth maximum effort will affect not only himself but those working under him as well.

10. Flexible. Has he demonstrated flexibility and is not fixed in his way of doing things? A given individual may be very qualified for the present job he holds without such flexibility yet valueless in the new post for which he is being considered. If the new job requires such flexibility this is an important factor in weighing the merits of available candidates.

11. Loyal. Has he demonstrated interest in and loyalty to the company? This may not be of importance as long as a man does an acceptable job at lower levels in the business but the higher he climbs on the staff the more important such loyalty becomes.

12. Intelligent. Can he grasp new ideas and new methods? Some of us have this very valuable asset as part of our natures while others never

seem able to acquire it no matter how hard they try. Yet it is an absolute must for any man climbing the ladder in a company organization.

13. Orderly. Is he an orderly individual? The man who lacks the ability to be orderly and neat about his work routines is going to be unable to enforce this upon others. The net result may be an entire department over which he has supervision, quickly dropping to his own levels of disorderliness.

14. Ambitious. Has he shown a definite desire for promotion within the company? Management can never expect maximum performance from an individual who has never demonstrated the desire for promotion. It is a requirement where we expect full performance from the new job. The man with no particular desire for promotion is so satisfied in his present job he can be expected to lack the ability to pass along necessary enthusiasm to anyone he may supervise in the new spot.

15. Quick to Learn. Does he need only the minimum of instruction to handle any task? There is little sense in promoting individuals if 100 percent supervision must still be given them by men higher up the staff ladder. Part of any new job will call for this necessary trait. It should be checked as carefully as any other point.

16. Reliable. Can he think things out where there are no precedents established? Just about any reasonably intelligent individual can "follow the book" in his job but it takes a little something extra to handle situations which have not been covered by such precedent. Picking the men who possess such ability will always lessen top management chores.

17. Works Well. Can he do his job without strain and yet show no sign of "loafing?" The higher the individual climbs the more essential it will be that he possess such ability.

18. Seeks Improvement. Does he look for ways to do the job better? Where this has not been evidenced in the individual's regular work routines in the past, it should be given the closest study in considering his status insofar as any promotion is concerned. **—The End**

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Some Tips on Starting Diesels in Cold Weather

Before you start kicking it, try these simple remedies on your diesel engine

By Herb Orwig, Development Engineer
Trojan Division, The Yale & Towne Mfg. Co.
New York City

REMEMBER THE STORY of the flight instructor who was teaching pilots how to handle sea planes. "The thing to remember, always," he said, "is that your plane is in the *water.*" So saying, he stepped off the float into the water.

So it is with diesels. You've got to keep reminding yourself of basic diesel facts. The diesel engine has no plugs; it relies on high compression in the cylinder to heat air enough to ignite the fuel injected into it. When the engine is cold, the metal engine parts rapidly absorb the heat, thus possibly preventing ignition. This is particularly true on cold days, and your engine may need help to get started.

Here are some things you might try, assuming the starter is turning the engine at normal starting speed:

1. Heat the air introduced into the cylinders.

2. Use a starting fuel that burns at a lower temperature than the diesel fuel.

Glow Plugs. In some open chamber diesels, a glow plug is mounted in the intake manifold. When fuel is sprayed onto this glowing element, a small fire is kindled in the intake manifold. This heats air drawn into the cylinder, giving enough boost to start the engine in most instances.

. . . Drain the oil from your engine while it is warm . . . it can be warmed in the morning and added just before cranking the engine . . .

Engines with a precombustion chamber design usually mount the glow plug in this small precombustion chamber so that ignition begins in a fractional part of compressed air in each cylinder where fuel is injected. Usually failure in starting with glow plugs comes because the operator is too impatient to allow the plug to heat fully before he begins cranking.

Low Flash Point Fuels. Ether and ether base fluids are fuels with a lower flash point, or temperature, at which they begin to burn. This method is better liked because it gives instantaneous results. Ether fluids are high energy fuels and if used carelessly or too freely can cause serious mechanical engine damage because of abnormal compression pressures.

In an engine with a glow plug in the intake manifold NEVER use ether and the glow plug at the same time. A nasty backfire or perhaps even more serious damage could result.

Ether starting fluids are available in gelatin capsules, pressure capsules and aerosol-type pressure cans. Each form has its particular hardware to direct the ether to the engine intake manifold. All of them work effectively—choose the one best suited to your needs. Both types of capsules are a "one shot proposition" while the aerosol can provides a more generous supply. Warm aerosol cans and capsules vaporize more quickly so keeping the ether indoors until ready for use is to your advantage.

Crankcase Oil. Very cold weather may cause crankcase oil to become very viscous. Obviously it is difficult for the oil pump to circulate thickened oil so that the initial start starves cylinder walls and bearings of oil for a short time. It is especially important to avoid speeding the engine during this critical period. There are multiple viscosity oils on the present market which are thinner when they are cold. These oils have a low viscosity oil base with certain resins added and thicken as they warm up. Diesel engine makers have been reluctant to approve their use; therefore always follow your engine maker's oil recommendation.

If it is practical at the end of the working day to drain the oil from your engine while it is warm, it can be warmed in the morning and added just before cranking the engine, with good results.

Batteries. Most automotive type diesels have an electric cranking motor as a utility starter. Since accessory loads vary so widely, the choice of batteries has always been the result of experience. Under normal conditions most batteries are adequate but cold weather causes frequent failures. Generally speaking, more and larger plates mean a greater reserve of cranking power. If your battery is in good condition but fails to start your engine by not lasting long enough, a larger battery will crank your engine longer. Price, physical size and weight are all good indications of battery size. Gasoline starting engines give unlimited cranking duration once started. Air starters are excellent since they usually give higher cranking speed but a regular mobile compressor unit is usually needed to supply enough air.

Head-Bolt Heaters. In some cases cylinder head bolts may be replaced with special bolts having built-in electrical heating units. These heaters help by giving warmth to the coolant in the engine water jacket and usually require only house current electricity which may be available in your shed.

After your diesel engine is started and running smoothly it will warm up to its most efficient operating temperature more quickly if it is run through its ordinary work cycle at a moderate pace. A good rule is to let the engine temperature come up to nearly normal before demanding full engine power.

The key to a smooth functioning diesel engine in cold weather is a thorough knowledge of the starting procedure rules—and following these rules every working day. **—The End**

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Pipe Line Pete's

IDEAS FOR THE FUTURE!

. . . in pipe line engineering, construction and operations

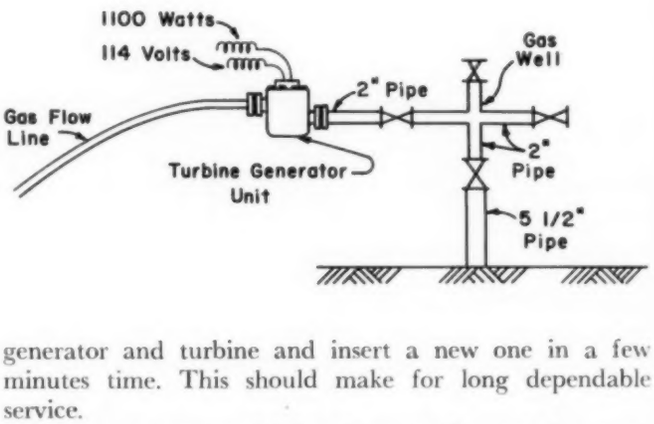
By Donald M. Taylor, Consultant, Houston

Generate Electric Power With Gas Flow At Wellhead

Like packing companies that use every part of the pig except his squeal, the pipe line industry is getting more and more mileage out of the products it handles. The latest along this line is an electric generator which can be mounted in the flow line at a gas well to supply 1100 watts of AC power at 114 volts right out in the field. None of the gas is allowed to escape; a small differential across a pneumatic turbine is sufficient to drive the generator.

This gives us electric power for control instruments, cathodic protection at remote locations where power supplies are not available. This unit should be particularly valuable to offshore operators.

The high volume, low differential turbine and generator are enclosed in a compact case which has been pressure tested to 10,000 psi. Separating the two elements are mechanical seals. However, to simplify construction, there is a minute opening between the two working parts in the case. One of the outstanding features of the new turbine generator set, is its interchangeable parts. To repair it, simply unbolt the case-head, remove the old generator and turbine and insert a new one in a few minutes time. This should make for long dependable service.



The prototype model has been under test for some years; and now a production model is undergoing what the developers hope is the final test. This unit should be available soon.

Russians Announce Solid Gasoline Bricks

By capturing gasoline emulsion droplets ranging from 0.002 to 0.0002 inch in diameter in plastic matrix, Russians claim they have developed gasoline "bricks" which can be burned like lumps of coal or liquefied again to power engines.

The purpose of the "bricks" is to reduce the need for pipe lines and railroad tankers. Moreover, they claim, this is an ideal fuel for isolated military posts which cannot be reached by tank car or tank truck.

The "bricks" are 95 percent gasoline by volume according to the Russians.

Gas Space Heaters Go Infra-Red

There is a certain chain of grocery stores in Houston, which operates wide open, so-to-speak, even on the coldest days. Despite the fact that one side of the store is open to the elements, you'll find its quite comfortable inside—even on cold days.

The explanation? Infra-red heaters spotted about the store. These new gas-fired heaters can heat opaque objects (you are one) without heating invisible materials such as air.

But an even more dramatic example was demonstrated at the Brussels World Fair recently. A chunk of raw steak was hung in an open space. Exposed to cold winds, and with no fire or cooking appliance under it, the steak suddenly began to sizzle in mid-air.

The explanation? A set of modern radiant gas burners several feet away. Only a dull glow from the burners gave evidence of gas combustion—there was no visible flame. The infra-red rays which the burners emit can travel through the air without affecting it or being affected by it. This demonstration could have been made even more effective by placing the burners behind panes of glass—lenses which would focus the infra-red rays more powerfully still, like rays of the sun through a burning glass.

What's the secret of the infra-red burners? Certain materials, when heated to proper temperature will emit large quantities of infra-red radiation—just as tungsten will emit light when heated to proper temperature inside a light globe. The widely-used Schwank burner utilizes a plate of ceramic material perforated by numerous, tiny, evenly-spaced holes. A gas-air mixture flows through the holes, which serve as burner ports, and is ignited on the surface of the plate. Thus diffused, the gas burns without visible flame, without requiring additional air from the atmosphere.

Because infra-red rays travel line-of-sight and are not greatly affected by atmosphere, they have an almost limitless number of practical applications.

Let's look at just a few.

Men working on docks or loading platforms out doors, or in huge drafty factory buildings or warehouses, can be kept warm and comfortable in spite of the chilly atmosphere around them, even in mid-winter. Tools and machinery are made warm to the touch, though the air remains cold.

Patrons at sidewalk-cafes—or patio guests—can be kept cozy even on nippy days by infra-red radiant heaters strategically placed. "Pavilions, circus tents and concerts sheds, too often cold and damp, can be turned into warm pleasant shelters. Cathredrals and airport . . ."

Whew!

You know, I make my living by writing. Because of this, I believe in the value of occasional exaggeration. But this ditty which was released by the Public Information Bureau of the American Gas Association may be a bit overboard. First, what is a concert shed? And take this passage:

"Spectators at football games and other outdoor events can dispense with lap robes, and even shed overcoats, given the benefit of strategically placed gas infra-red radiant heaters."

Hah!

Infra-red heaters may be good—but not *that* good. As for me, I'll still prefer an infra-blonde radiant heater every time even if she's in an overcoat and under my lap robe . . .

Vending Machines Sell Worms; Translucent Ceramic Developed

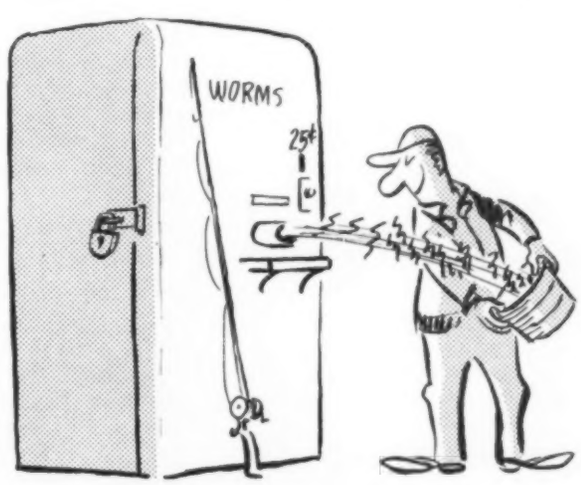
Vending Machine Sells Worms. It's trite to say it, "but times sure are changing!" Used to, you dug a few wigglers, stashed them in a tomato can with some dirt, and ambled off to the creek with a cane fishing pole and little ambition.

But now! Melt into your air-conditioned, swivel-seated car (the exertion of sliding across 12 inches of seat cover was too much effort according to Detroit) drive to a worm vending machine; insert a quarter and receive 12 wigglers, held at a controlled 40° F to reduce their vigor in captivity; humidity too is controlled.

Now all we need is a machine to bait the hook and catch the fish.

Balloon Soars 150,000 feet above South Dakota. The purpose to study antimatter and cosmic radiation. This is the record in ballooning!

New Ceramic is Translucent, Strong. It is made from aluminum oxide; G. E., the developer, calls it Lucalox. It is easy to fabricate; and, according to researchers who

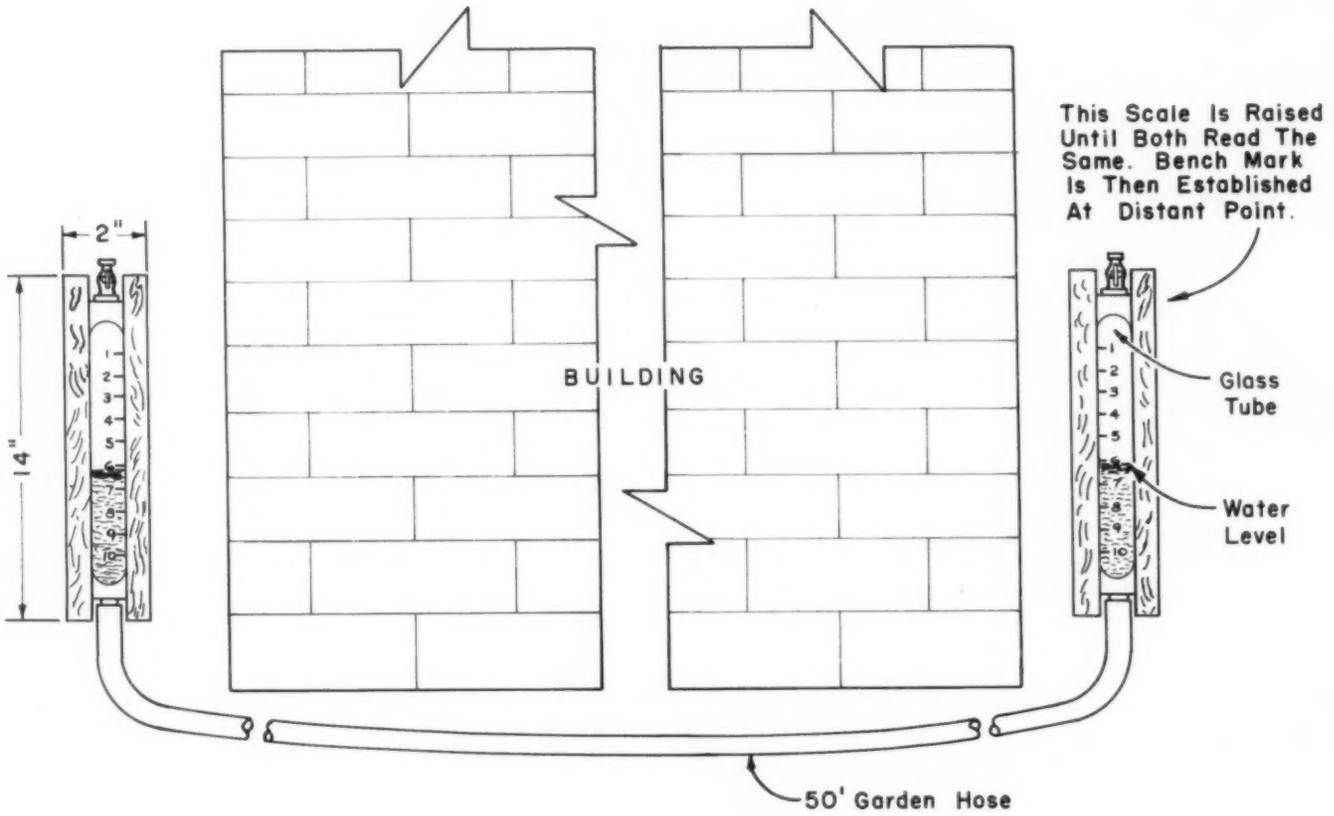


discovered it, its strength, translucence, heat resistance afford a unique combination. Will this enable us to see inside engines, etc.?

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas

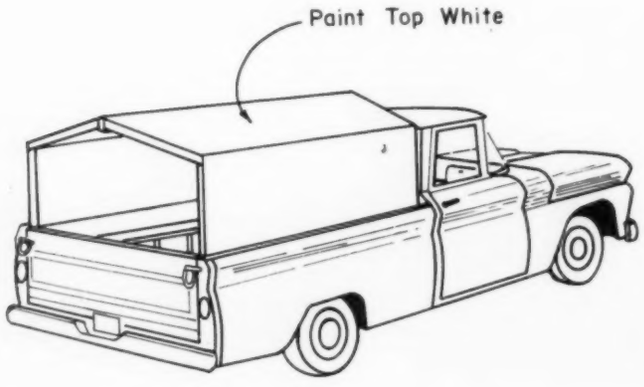


Use Glass Tubing and Garden Hose for Inexpensive Level

Attach glass tubing to either end of a 50-ft. length of garden hose and make an inexpensive level to substitute for the more precise instrument of the surveyor.

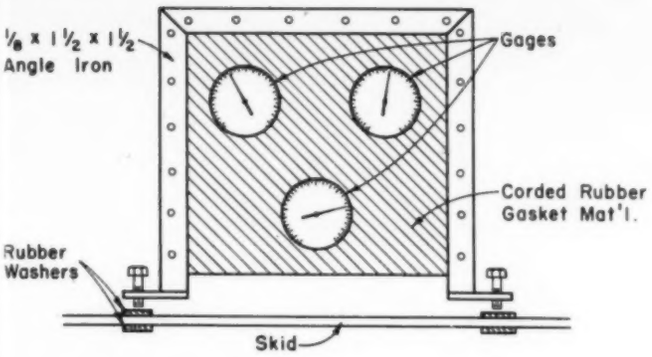
Light transparent plastic tubing can be used as well; however, if glass tubing is used, it should be sealed in the hose with proper glue to prevent leaking.

To use this "instrument" simply fill it with water. Then bring the water level in one end of the hose to the level desired at the other end. One of the advantages of this arrangement is that the level can be carried around corners, through doors, etc. One word of caution. Be sure there is no air trapped in the hose.



Paint Tops of Gang Trucks White for a Cooler Inside

This is a trick the air lines learned several years ago before air conditioning units were so efficient. The temperatures inside planes could be greatly reduced by painting over the aluminum skin with white paint. White is the most reflective color—considerably more effective than aluminum paint—and when gang trucks are painted white on top they too, are cooler inside. The cost runs only a few dollars per vehicle, but the savings in tempers, fatigue, etc., will more than justify this small cost.



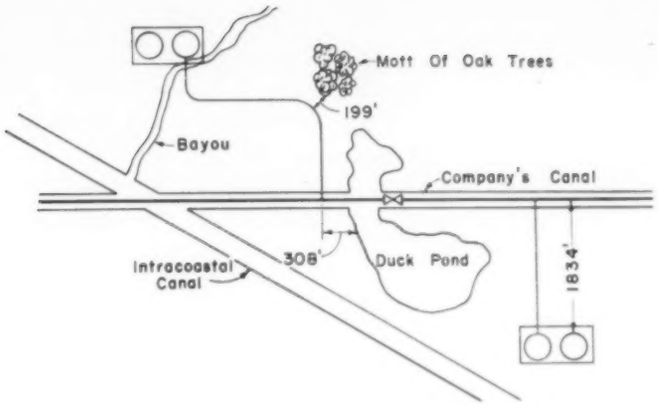
Reduce Vibrations to Make Engine Gages Last Longer

The two big sources of trouble so far as gages are concerned are corrosion and vibration. Of the two, vibration is perhaps the most costly.

Shown here is one solution to the problem. By mounting the ammeter, vacuum gage, etc., on a rubber dash board, a company was able to eliminate the high failure rate of gages on a certain type engine.

Here's how the rubber "dash board" was made. First a frame 8 inches wide and 8 inches high was made from ⅛ by 1½ by 1½-inch angle iron. Inside it, heavy rubber gasket material with proper holes for gages was screw mounted. The instruments were mounted inside the holes in this corded rubber material. The panel itself was then mounted onto the engine skid, using rubber washers where the frame bolted on.

The rubber material is able to absorb a great portion of the vibration; but the amplitude and frequency of the vibrations it does not dampen are such that the gages are not damaged.



Resurvey Pipe Lines Through Marshes with Aerial Photos

The biggest bargain you can find in the pipe line industry is Department of Agriculture aerial photographs. Contact prints arranged in series to provide stereoscopic views of terrain, cost but little.

Rather than go to the great expense of re-surveying lines in the marshes of South Louisiana, one company purchased a series of the photographs, and from the stereoscope plotted the line along with major features of terrain. The draftsmen showed line location (which readily showed up on the aerial photographs) the tank batteries, pumps, canals, lakes and other features which helped with inventory and with physical location.

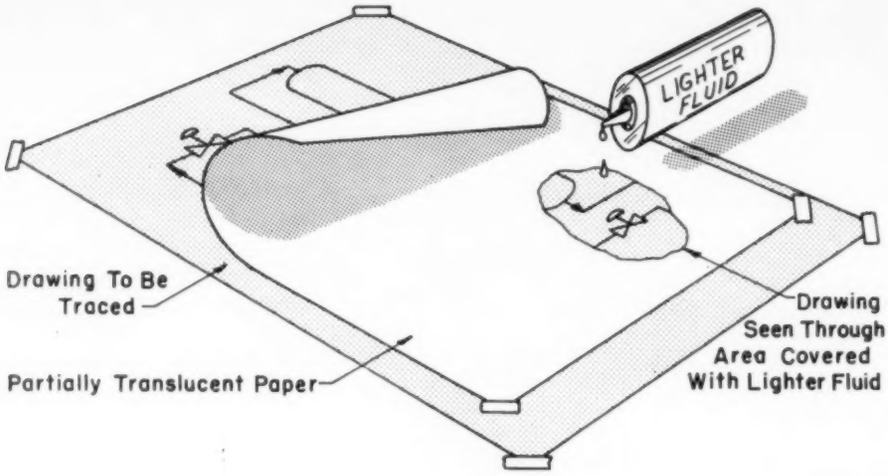
The first field test of the new maps proved their effectiveness without doubt. One of the home office engineers used them to locate and visit 16 tank batteries in less than 3 hours without assistance. Previously, anyone not familiar with the field would have to rely on directions from gagers or local people to locate batteries.

The cost of the aerial photographs runs only 25¢ per square mile.

Junk Pipe Makes Excellent Valve Guard in Open Areas

In many fields there are numerous valves located in widely separated, open areas. If livestock graze on the lease, there is always the danger that a valve may be inadvertantly opened or closed by the stock. In many cases, this could be disastrous if personnel were repairing a line etc. To eliminate this hazard, valve guards are installed over all valves located in open areas or areas not within the confines of a tank battery fence.

The valve guard shown is easily and quickly constructed and installed. The four supporting legs are constructed of junk 2½-inch line pipe or tubing and driven into the ground far enough to obtain desired rigidity. The top portion is constructed of junk 2-inch line pipe as shown. Four short pieces of 2-inch pipe are welded on each corner vertical to the plane of the top portion. These short pieces then are inserted into the legs, and the top portion is in place. A vertical lift is all that is required to remove the top section if a valve requires repair or changeout.



Lighter Fluid Makes Paper Transparent

Often it is desired to trace lines from printed or hand drawn sheets onto a piece of paper which is not sufficiently transparent to permit easy performance of the operation. Ordinary white bond paper falls into this category.

One common method is to place both sheets on a back lighted sheet of glass. However, even this is not always successful if the sheet you wish to trace from is opaque. The difficulty may be overcome quite simply by placing the tracing paper directly over the material you wish to trace—then spread some ordinary lighter fuel over the top sheet. The printed matter underneath immediately becomes visible and may be readily traced with either pencil or black India ink. More lighter fuel may be added as required.

The lighter fuel will not smear pencil or black India ink and the treated surface readily accepts either pencil or ink. In a few seconds the lighter fuel evaporates without a trace and the paper is restored to normal.

Adjustable Pipe Rack For Pick Up Trucks

A pipe rack that extends and contracts like the jaws of an old-fashioned "monkey" wrench has a number of advantages for the average service truck. First, when not in use, it does not extend the width of the truck; and second, it can be adjusted to the size of the load.

Pick up trucks are the real work horses of pipe line maintenance crews. They are used for hauling everything from valves to small diameter pipe. Because the latter loads may vary from one joint to 30, an adjustable pipe rack is often quite handy. Here's the way the one shown here was made.

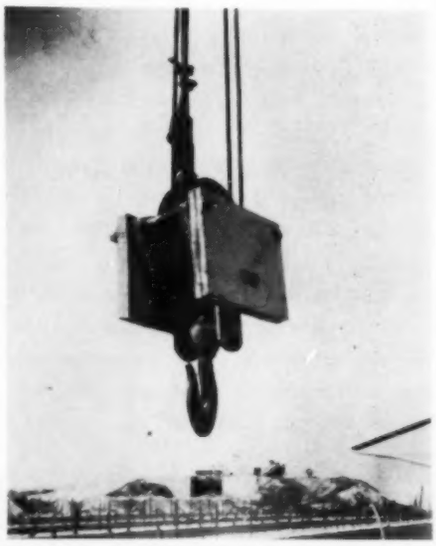
First, the main section made of angle iron sections welded together to form a rectangular section were welded to the bumper guard. The "L"-shaped outer portion of the rack slides into the horizontal member, and holes drilled through both pieces make the rack adjustable. A chain welded to the rack and attached to a boomer completes the device. When not in use, the "jaws" of the rack are locked in closed position and tied off with the chain.

Wrap Seldom Used Tools in Protective Aluminum Foil

You can usually form an accurate opinion of the quality of a station's maintenance and operation by noting the quality of its "housekeeping." In fact, station crews are often rated on "housekeeping" more than any other factor.

If housekeeping is so important why not pick up a few of the tricks of the "pros" in the field—the housewives? Ever notice the mileage they get out of aluminum foil? They wrap it around anything they want to keep and protect. (Not husbands, of course.)

Why not buy a few rolls and see how handy it will be around the station? One of the most obvious uses would be for wrapping seldom used tools. The metal foil will protect the tool against moisture and corrosion if it is properly sealed. Also, there will be many uses for it in the warehouse, and during overhaul it should prove useful for wrapping delicate engine parts.



Fabricate Weights on Block to Speed Work

Often, the faster a block will un-spool the drum on a side boom or a crane, the faster it can work. Of course, the heavier the load or the heavier the block, the faster it will un-spool. But where two or three-sheave blocks are used, the weight of the block is insufficient to un-spool the wire rope rapidly.

One solution is to add a headache ball above the hook. Another solution is shown here. Simply bolt plates on the side of the block, using longer studs as shown. The amount of weight can be controlled by the number and thickness of the plates. The expense is negligible when compared with the increase in speed of work.

Rules of Thumb

and Engineering Data Sheets for the Pipeliner's field notebook

$25 for Engineering Data Sheet $15 for Rule of Thumb

These practical aids give quick, reasonably accurate answers to design, maintenance and cost estimating problems. PIPE LINE INDUSTRY will pay $25 for each chart, nomograph or data sheet published—$15 for each Rule of Thumb. Send your ideas to PIPE LINE INDUSTRY, P. O. Box 2608, Houston, Texas

Engineering Design

—69— How To Estimate Equivalent Length Factors For Gas Lines

This table shows the equivalent length factors for pipe lines of different diameters. It is based on the Panhandle Formula and the factors were obtained by varying the lengths of the pipe and keeping the other variables constant.

Example: Find the equivalent length of a 24-inch pipe line as compared with a 12¾-inch line.

Enter the chart at the top—24-inch—(23.00 ID) and proceed downward to the 12.250 parameter. The equivalent length is 21.2.

This means that under the same conditions of temperatures, pressures, specific gravities, etc. one mile of 12¾-inch pipe will flow the same amount of gas that 21.2 miles of 24-inch will flow. Another way of putting it, the pressure drop in one mile of 24-inch pipe will be the same as that in .048 miles of 12¾-inch if the pressures, volumes etc. are the same.

Where a line is composed of several sizes of pipe diameters or where the lines are looped, this chart should prove useful. In solving problems of this sort, the line is reduced to an equivalent length of some arbitrarily selected size pipe and treated as a single line of uniform size.

	Nominal Diameter	36"	34"	30"	26"	24"	24"	22"	20"	18"	16"	12¾"	10¾"	8⅝"
Internal Diameter		35.250	33.250	29.375	25.375	23.375	23.000	21.500	19.500	17.500	15.500	12.250	10.250	8.125
35.250"	36"	1	0.758	0.416	0.204	0.137	0.126	0.092	0.056	0.034	0.019	0.006	0.002	0.0008
33.250	34	1.32	1	0.55	0.270	0.181	0.167	0.121	0.075	0.044	0.025	0.008	0.003	0.001
29.375	30	2.41	1.82	1	0.492	0.330	0.305	0.22	0.136	0.081	0.045	0.014	0.006	0.002
25.375	26	4.90	3.71	2.03	1	0.671	0.622	0.45	0.278	0.164	0.092	0.029	0.012	0.004
23.375	24	7.25	5.54	3.04	1.49	1	0.922	0.67	0.415	0.246	0.137	0.044	0.018	0.006
23.000	24	7.90	6.00	3.29	1.62	1.08	1	0.72	0.450	0.267	0.148	0.048	0.020	0.0064
21.500	22	10.93	8.31	4.55	2.24	1.50	1.37	1	0.624	0.369	0.205	0.065	0.027	0.009
19.500	20	17.60	13.33	7.31	3.59	2.41	2.22	1.60	1	0.590	0.328	0.105	0.044	0.014
17.500	18	29.8	22.5	12.35	6.08	4.075	3.78	2.72	1.69	1	0.555	0.177	0.074	0.024
15.500	16	52.8	40.5	22.2	10.9	7.345	6.75	4.88	3.04	1.80	1	0.319	0.134	0.043
12.250	12¾	168	127	69.8	34.3	23.01	21.2	15.35	9.55	5.65	3.13	1	0.420	0.136
10.250	10¾	400	303	167	81.7	54.67	50.6	36.5	22.7	13.4	7.47	2.38	1	0.324
8.125	8⅝	1235	935	513	252	168.8	156.2	112.5	70.5	41.5	23.0	7.35	3.08	1
6.125	6⅝	4860	3680	2020	992	666	615	443	276	163	90.7	29.0	12.2	3.94

Engineering Design

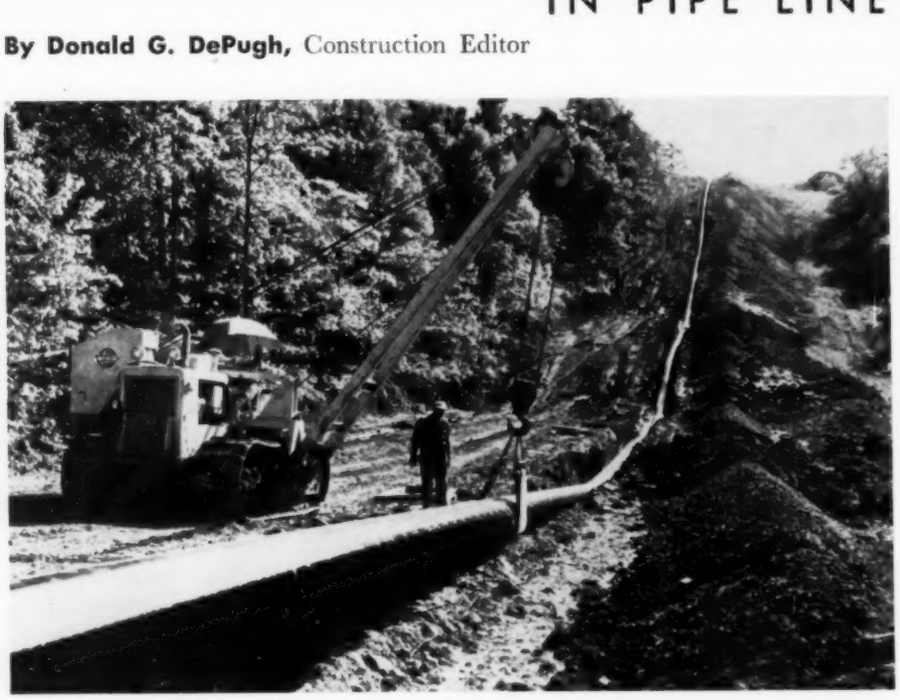
—70— How to approximate the friction loss per mile in a crude oil transmission line

The approximate economic optimum diameter for crude oil lines carrying API gravities of 30°-40° and viscosities ranging from 75 to 200 SSU at 35° F will have a pressure drop of 13 —¼ (O.D. of pipe) psi per mile. Example: Ignoring terrain, find the approximate pressure drop per mile in a well designed 20-inch crude oil line? **Solution:** Pressure drop per mile would be 13 —¼ (20) = 13 —5 = 8 psi per mile.

The economic optimum diameter for a pipe line depends on many variables including pressures, length, pipe stress allowed, pump station sites, length of line and expected growth of the throughput. This rule is for rough approximations only.

WHAT'S HAPPENING IN PIPE LINE CONSTRUCTION

By Donald G. DePugh, Construction Editor



Lowering-in Texas Gas Main Line Loop

Sideboom operator lowers-in section of 26-inch pipe on Western Pipe Line, Inc. spread near Cloveport, Ky. Western recently completed construction on 35 miles of 26 and 36-inch main line loops for Texas Gas Transmission Corporation in Mississippi and Kentucky.

Natural Gas Pipeline Company Proposes $31 Million Main Line Looping Project

Natural Gas Pipeline Company of America has filed an application with the Federal Power Commission requesting permission to construct 151 miles of 36-inch loops and a 180-mile, 24-inch gas line.

The $31 million project will increase peak day delivery by 100 MMcf to 830 MMcf of gas daily. The 36-inch loops would parallel sections of NGPL's main line between Ford County, Kansas, and Joliet, Ill. The 24-inch line would connect existing facilities near Minneola, Kansas, and Kiowa County, Okla. Construction of metering facilities at the Joliet terminal will be included.

NGPL last year completed a $63 million expansion which boosted its capacity by 185 MMcf of gas daily. This looping project consisted of 511 miles of 36-inch. The new gas supplies will be apportioned among utility companies in the Chicago area. Peoples Gas Light and Coke Company, NGPL parent firm, will receive 40 MMcf per day.

Texas Illinois, another Peoples subsidiary serving the Chicago area, is awaiting FPC approval on its 371-mile 30-inch looping project costing about $43 million.

Collins Construction Co. Awarded Pemex Contract

Collins Construction Company and Constructora Inde S.A. de C.V. of Mexico City, have been awarded a contract for eight river crossings on the Petroleos Mexicanos gas line from Pemex City to Mexico City.

The 12- and 24-inch crossings will include the Grijalva, Samaria, Tonala, Coatzacoalcos, San Juan, Tesechoacan, Obispo and Papaloapan. The Grijalva is one of the largest river systems in the world. During the rainy seasons from June through October the rivers overflow their banks up to 10 miles on either side.

Burmah Oil Company Starts Work on 720-Mile Crude Line

Burmah Oil Company has begun preliminary work on its 720-mile, 14-16-inch crude oil line from Nahorkatiya, Assam, to Barauni, Bihar. The first section of the line, 260 miles, 16-inch from Nahorkatiya to Nunmati, is scheduled to be constructed in 1960. The 460-mile, 14-inch section is planned for 1962. Crude will be supplied to proposed refineries along the route. The line will be designed to deliver 15,000 barrels daily to the Nunmati refinery and 40,000 barrels to Barauni refinery.

Oil India Private, Ltd., owned by Burmah Oil Company and the Indian government, will operate crude production and pipe line system. Total cost of the project will be $171 million; the pipe line will cost about $112 million.

Alberta Gas Trunk Line Co. Granted Construction Permit

Alberta Gas Trunk Line Company has received approval from Alberta deputy minister of mines and minerals to construct its $103-million foothills system. The system is part of the 1,300-mile line from Canada to California planned by Pacific Gas & Electric Company, Westcoast Transmission Company and Alberta Gas Trunk Line. Alberta will lay over 300 miles of the main line through Alberta.

Texas Gas Transmission Plans New Storage Field

Texas Gas Transmission Corporation has filed an application with the Federal Power Commission seeking permission to develop and operate the West Greenville gas field as a storage reservoir.

Texas Gas plans to lay a 12-inch line from its main line system at Slaughters, Ky., to the field in 1960. The line along with small compressor facilities will be used to move gas back into the reservoir for underground storage. A dehydration plant and measuring station will be installed for the storage operation.

Federal Power Commission Decision Reversed by Courts

An FPC decision denying Transcontinental Gas Pipe Line Corporation approval to transport gas for Consolidated Edison was reversed by The Third Circuit Court of Appeals.

Transco will carry 50 MMcf of gas per day for delivery to the New York City utility. Consolidated Gas will buy the gas from South Texas producers and serve the Manhattan area.

National Iranian Oil Co. Plans 140-Mile Gas Line

The National Iranian Oil Company and Ministry of Industries and Mines will construct a 140-mile, 10-inch natural gas line from Gach Saran to Shiraz, Iran. Societe Entrepose and Constructors John Brown will lay the line with construction scheduled to start in February.

The line will supply fuel requirements of a fertilizer plant now under construction in Shiraz and will eventually replace liquid fuels used by major industries in and around Shiraz. Studies are underway to extend the use of gas for domestic requirements in Shiraz.

Transco Awards Contract To O. R. Burden Construction

Transcontinental Gas Pipe Line Corporation has let a contract to O. R. Burden Construction Corporation for 29 miles, 20-inch in South Texas in McMullen and LaSalle counties. Transco soon will be awarding contracts on 38 miles of 36-inch loops between Houston and LaBlanc and Elton, La.

Service Pipe Line Constructing Gathering System

Service Pipe Line Company is laying 43 miles of 2-4-6-inch crude gathering lines in Nowata, Okla., area. Ivan C. Wood, left, maintenance foreman, and Arthur M. Hill, superintendent maintenance, check construction progress on new system. The new lines will replace present system which will be inundated by the Oologah Reservoir. When the Oologah dam is completed, line in the background will be under approximately five feet of water.

Trans-Canada Pipe Lines Limited Plans 50-mile Lateral To U.S. Border

Trans-Canada Pipe Lines Limited plans to construct a 50-mile, 30-inch gas lateral line from its main line near Winnipeg to Emerson, Manitoba. The project is contingent on Trans-Canada's authorization to export gas to Midwestern Gas Transmission Company. The Canadian company also will install several additional compressor stations to supply gas to Midwestern. Cost of the program is about $45 million and construction is scheduled to begin next spring.

Midwestern has received a permit from the FPC to import Canadian gas and construct a 504-mile, 24-inch gas line from Emerson to Marshfield, Wis. with two compressor stations and 56 miles of laterals. Midwestern plans to import 204 MMcf of gas daily from Trans-Canada.

Trans-Canada also will construct 74 miles of 34-inch loop lines in 1960. Compressor station additions will be at Swift Current and Indian Head, Saskatchewan, and Portage la Prairie, Manitoba. Loops for 1961 will total 268 miles of 34-inch with additional horsepower planned at the same stations, costing $69 million. A $46 million program for 1962 includes 122 miles, 34-inch, loops and several station additions.

Transco Plans 280 Miles, 30-36-Inch Main Line Loops For 1960 Construction

Transcontinental Gas Pipe Line Corporation announces its construction program for 1960. In an application filed with the Federal Power Commission, Transco plans to lay 280 miles of 30- and 36-inch loop lines and install additional horsepower facilities.

The loops will consist of 211 miles of 36-inch and 69 miles of 30-inch to be constructed in Texas, Louisiana, Mississippi, Alabama, Georgia and South Carolina. Horsepower additions will total 32,040 and the $52 million 1960 proposal will increase Transco's system by 108.8 MMcf of gas daily.

Transco received approval earlier on its $53 million 1959 program which consisted of 129 miles of 30- and 36-inch loops.

Construction of all approved and pending facilities would give Transco a peak day delivery capacity of 1.42 billion cubic feet without storage and a 1.76 billion with storage.

Mississippi River Fuel Files Application with FPC

Mississippi River Fuel Corporation has filed an application with the Federal Power Commission to construct 5,000 compressor horsepower in the Woodlawn Field, Harrison County, Texas.

Cost of the project is estimated at $1.4 million.

PROPOSED PIPE LINE CONSTRUCTION

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

U. S.

Alaska Juneau Gold Mining Co., Los Angeles, 425 miles, 16-inch, gas, Oklahoma City area to St. Louis, planned.

Anchorage Gas Corp., Houston, 165 miles, 12-inch, gas, Kenai to Anchorage, Alaska, $15 million, planned.

Arkansas Industrial Pipeline Corp., Shreveport, 130 miles, 18-inch, gas, Perla-to-Helena, Ark., $9 million, planned.

Atlantic Seaboard Corp., Charleston, W. Va., 26-miles, 26 and 20-inch, gas, in West Virginia, Virginia and Maryland, contract let on 19 miles to H. L. Gentry Construction Co.

Carolina Pipeline Co., gas, main line, from near Aiken to Pontiac, S. C., $5 million, approved.

Coastal States Gas Producing Co., Corpus Christi, Texas, 289 miles, 14 and 18-inch main line and gathering system, McAllen to Falfurrias, Tex., area, and Lopena to La Salle County, $12 million, contract let on 200 miles to O. R. Burden Construction Corp.

60 miles, small diameter, gas gathering line, to tie in with system under construction and extend to Pearsall County, Texas, planned.

25 miles, gas, Associated Gas & Oil Co. field to South-Tex Corp., processing plant west of Corpus Christi, Texas, planned.

37 miles, gas gathering in Brown, Eastland, Comanche and Erath counties, Texas, planned.

Coastal Transmission Corp., Houston, compressor station additions and new lateral lines, $6.2 million, before FPC.

Colorado Interstate Gas Co., Colorado Springs, 140 miles, gas, Green River, Wyo.-to-Provo, Utah; 109 miles, 26-inch, Texas Panhandle to southeastern Colorado; 136 miles, 34-inch, southeastern Colorado-to-Pueblo, Colo.; 107 miles, 30-inch, Pueblo-to-Denver, $91 million, before FPC.

Colorado Oil & Gas Corp., Denver, 400-miles, gas, from Gubik field to Fairbanks, Alaska, planned.

Columbia Gulf Transmission Co., Houston, 12.8 miles, 6 and 20-inch, gas, loop line in Louisiana, $730,000, authorized.

East Coast Pipeline Co., 90 miles, 12- to 24-inch, products, Linden, N. J. to Suffolk County, N. Y., $25 million, planned.

El Paso Natural Gas Company, El Paso, 244 miles, 30-inch, Permian-San Juan loops, 108 miles, 20-inch, field feeder lines, before FPC.

69,240 hp in new and existing stations in Texas, Oklahoma, New Mexico and Utah, planned.

400 miles, 34-inch, Salt Lake City, Utah, to California border, before FPC.

Equitable Gas Company, Pittsburgh, Penn., 11.7 miles of storage pipe line and other facilities, $2,091,430, authorized.

12½-miles, 16-inch, paralleling existing system in Harrison and Marion counties, W. Va., authorized.

Florida Pipeline & Storage Co., 54 miles, products, Port Everglades to Homestead Air Force Base, Fla., planned.

Gillette Pipeline Co., Cheyenne, Wyo., 103 miles, crude, from Dead Horse Creek field to Casper, Wyo., planned.

Great Northern Railway, St. Paul, 400-600 miles, 12-20 inch, crude, from Williston Basin to St. Paul-Minneapolis and Duluth-Superior areas, considered.

Gulf Resources, New York, 125 miles, gas, gathering system, from Lopena area in Zapata County to a point in La Salle County, Texas, planned.

Hope Natural Gas Co., Clarksburg, W. Va., 45 miles, gas, from West Virginia to Pittsburgh area, planned, 20 miles, 24-inch, gas, in Wertzel and Monongalia counties, W. Va., authorized.

Humble Oil & Refining Company, Houston, 116 miles, gas, gathering various sizes, southwest Texas, contracts let on 57 miles to O. R. Burden Construction Corp. and H. B. Zachry Co.

Iron Ranges Natural Gas Co., 115 miles, gas, from Itasca and St. Louis counties along route of Mesabi range from Grand Rapids to Aurora, Minn., $5 million, FPC authorization.

60 miles from Duluth to Silver Bay, Minn., FPC authorization.

Michigan Wisconsin Pipe Line Co., Detroit, 311 miles, gas, Marshfield to Appleton, Wis., 66 miles, Illinois, Indiana, and Michigan, 5,280 hp station at Marshfield, $24 million, FPC authorization.

Midwestern Gas Transmission Co., Houston.

504 miles, 24-inch, gas, from Minnesota-Canada border near Winnipeg to Marshfield, Wis., $52 million, FPC authorization.

Missouri-Kansas-Texas Railroad, 1400 miles LPG line, Midland, Texas, area to St. Paul-Minneapolis, Minn., and Madison, Wis., $55 million, planned.

Natural Gas Pipeline Company, Chicago, 29 miles, 10-inch lateral, in Oklahoma, FPC examiner approval.

151 miles, 36-inch, gas, loops, between Ford County, Kansas and Joliet, Ill. and 180 miles, 24-inch, main, from Minneola, Kansas to Kiowa County, Okla., $31 million, before FPC.

Northern Natural Gas Company, Omaha.

171 miles, main line extensions, 66 miles, main loops, 139 miles, branch lines, 6,000 hp additions, to extend system from Minneapolis to Duluth-Superior area, $25.7 million, contracts let on 315 miles to Williams Bros. Co. and R. H. Fulton & Co.

46 miles, main line extensions, 19[illegible] miles, loops, 1,767 miles, branch lines, and 45,400 additional hp, in Iowa, Minnesota, South Dakota, Nebraska, Wisconsin and Illinois, $76.7 million, FPC authorization.

37 miles, 30-inch, Bushton compressor station to Otis field, Kansas, 7,000 additional hp at Bushton, and development of underground storage facilities at Otis field, $20 million, before FPC.

Ohio Fuel Gas Co., 59 miles, gas, 4-24-inch main lines, in Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingum, Stark and Wayne counties, Ohio, $5.1 million, planned.

Pacific Gas & Electric Co., San Francisco, 296 miles, 36-inch, gas, from Klamath Falls, Ore., to Antioch, Calif., southern section of line from Canada to California, before California Public Utilities Commission.

131 miles, 34-inch, loops, Topock-Milpitas, before FPC.

42 miles, 30-inch, gas, Pittsburg to Irvington, Calif., planned.

Pacific Gas Transmission Co., San Francisco, 614 miles, 36-inch, Kingsgate B.C. to Klamath, Ore., northern section of Canada to California line, before FPC.

Pacific Lighting Gas Supply Co., 128-mile, 34-inch, gas, main line from Topock, Ariz. to Newberry, Calif., authorized.

Pacific Northwest Pipeline Corp., Salt Lake City, 100 miles gas, gathering lines **in San Juan Basin, Garmesa, Piceance** Creek, and Big Piney Fields, $3.5 million, planned.

59 miles, 16 and 20-inch, gas, from a point on main line near Camas, Wash., to Salem, Ore., $6.1 million, before FPC.

Permian Basin Pipeline Company, Omaha, 83 miles, 16-inch, gas, from Pioneer's proposed facilities to Spraberry, Texas, and 3,960 hp compressor station, $5 million, FPC examiner approval.

Pioneer Natural Gas Co., Amarillo, Texas, 62 miles, 10-inch main, Pampa, Texas, to Canyon, in Randall County, Texas, 20 miles, small diameter, gathering, 4,000 h.p. stations, $4.5 million, planned.

Phillips Petroleum Co., 25 miles, 6 to 20-inch, gas, South Eunice, New Mexico area, planned.

52 miles, 4 to 20-inch, gas, Gaines County, Texas, planned.

44-mile, 6-inch, products line, from Rocky pump stations to Amarillo, Texas, planned.

Rio Gas Gathering Co., San Antonio, 97 miles, 3 to 8-inch, gas gathering, South Texas, to supply gas to El Paso Natural Gas Company, planned.

Rocky Mountain Natural Gas Company, 65 miles, gas, southwestern Colorado to serve Delta, Orchard City and Montrose, Colo., planned.

Shamrock Oil & Gas Company, 49 miles, 20-inch, gas, Dumas to Amarillo, Texas, planned.

Southern California and Southern Counties Gas Cos., Los Angeles, 200 miles, 34-inch, from Nevada-California border to point near Fullerton, Calif., $44 million, before Public Utilities Commission.

Southern Natural Gas Company, Birmingham, 490 miles, 16-24-inch, loop lines, gas, between Gwinville, Miss., and Wrens Ga; 62 miles, 14-inch, loops, along Atlanta-Macon line; 53 miles, 6⅝ to 14-inch, loops, along various branch lines. 3,140 additional hp at Gallion and Elmore, Ala. and Wrens, Ga. 60 miles, 20-inch, loops, in Louisiana between Franklinton and White Castle and South of Toca. Lateral lines south of Gwinville and west to Cranfield field. 8,720 hp added at Franklinton, White Castle, Patterson and Brookhaven, contracts let on 442 miles to Sharman, Allen, Gay & Taylor; Oklahoma Contracting Co.; Harbert Construction Corp.; C. S. LeNoir Construction Co.; and Buchanan Contracting Co.

Standard Oil Company of California, 22 miles, 8-inch, crude, Kenai Peninsula to Nikiski, Alaska, $4 million, considered.

Tennessee Gas Pipeline Co., Houston, 21 miles, 16-inch, 2 miles, 12¾-inch, gas, Louisiana coast, Vermillion, Blocks 46 and 64, $2.9 million, before FPC.

158 miles, 36-inch, looping system in Louisiana and Mississippi, to supply Midwestern additional gas at Portland, Tenn., $61.4 million, authorized.

Texas Eastern Transmission Corp., Shreveport, La.

65 miles, gas, Delmont, Penn., to Lambertville, N. J., before FPC.

40 miles, Lambertvile to Linden, N. J., before FPC.

350 miles, 24-inch, coal slurry, West Virginia to New York, considered.

Texas Electric Service Company, Fort Worth, 300 miles, gas, Old Ocean field to Fort Worth, Texas, $25 million, considered.

Tensas Gas Gathering Corp., Shreveport, 36.6 miles, gas, gathering system in Rodney Field, Jefferson County, Miss. and from North and South Locust Ridge, Lake St. John Field in Tensas and Concordia parishes, La., $855,413, authorized.

Texas Illinois Gas Pipeline Company, Chicago, 16,000 additional hp to stations at Lufkin, and Marshall, Texas; Texarkana, Malvern, Searcy, and Biggers, Ark.; Jackson, Mo.; and Hammond. Ill., $3.9 million, FPC examiner approval.

371 miles, 30-inch, loops, and 45 miles, laterals, gas, 6,700 hp station in Victoria County, Texas, $43.5 million, before FPC.

Transcontinental Gas Pipe Line Corporation, Houston, 129 miles, 30 and 36-inch loops; 53 miles of laterals, and additional horsepower capacity, in Texas, Louisiana, Alabama, Georgia, North Carolina, Virginia, Pennsylvania and New Jersey, $53 million, FPC examiner approval.

211 miles, 36-inch, and 69 miles, 30-inch, loops and additional 32,040 hp, in Texas, Louisiana, Mississippi, Alabama, Georgia and South Carolina, $52 million, before FPC.

13 miles, 24-inch and 18 miles, 20-inch loops, Louisiana, FPC authorization. 14 miles, 16-inch laterals, 1-mile, 12-inch lateral, Louisiana, $2.1 million, FPC authorization.

Underground Storage & Exploration, Upper Darby, Penn., 394 miles, 12-inch LPG, from Moundsville, W. Va. to Newark, N. J., $9 million, approved.

95 miles, 6-8 inch, laterals to Mauch Chunk, Penn., and to Philadelphia, planned.

Valley Gas Transmission, Inc., Houston, 160 miles, 3 to 8-inch, gas, gathering, in Hidalgo, Brooks, Starr and Jim Wells Counties, Texas, $15 million, before FPC.

Wilcox Crude Oil Corp., Shreveport, La., 20 miles, crude line in east central Louisiana, $500,000, planned.

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., to Bella Coola, B. C., before B. C. government.

Alaska-Yukon Refiners and Distributors, Ltd., Edmonton, Alta., 150 miles, products, serving Alaska and Yukon territory, $3.5 million, planned.

Alberta Gas Trunk Line Company, 386 miles, 26-36-inch, gas, main, Berland River area, Alberta, to Alberta-British Columbia border; and 235 miles, 8-18-inch, gas, gathering, Alberta, $100 million, Alberta Oil and Gas Conservation Board, approved.

Alberta Natural Gas Company (Jointly owned by Westcoast Transmission Co. and Alberta & Southern Gas Co. Ltd.) 110 miles, 36-inch, gas, Alberta border to British Columbia-Idaho border, supply gas to Pacific Gas & Electric Co., $40 million, planned.

Arab League Oil Committee, large diameter crude line from Persian Gulf to Mediterranean Coast, $500 million, considered.

Aurine Alps Railway & Pipeline, 200 miles, crude, Venice to Munich, Germany, considered.

Bituminous Oil Pipeline Co., Calgary, 250 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, approved.

Burmah Oil Co., Ltd., 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta, India.

Cartier Gas Corp. (St. Maurice Gas, Inc., and Consumers Gas Co., Toronto), 170 miles, gas, Montreal to Quebec City, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

Creole Petroleum Co., 44 miles, 12-30-inch, gas, Bachaquero to Tia Juana, Venezuela, planned.

Development and Resources Corp., 70 miles, 8 inch, gas, from Agha Jari oil field to Ahwaz, Iran, planned.

Entre Nazionali Idrocarburi, Rome, Italy, crude, from Qum field in Iran to the Mediterranean Sea, considered.

Foothills Pipe Line, Ltd., 500 miles, 12 to 16-inch, LPG, from Alberta to Pacific Coast, $80 million, considered.

Gibson Crude Oil Purchasing Co. Ltd., 170 miles, crude, Milligan Creek, B. C. to Grande Prairie, Alta., planned.

Hydrocarbons Pipeline, Ltd., Winnipeg, Manitoba, 880 miles, 6-8 inch, products, from Edmonton to Winnipeg, $35 million, partial authorization.

Independent Pipe Line Co., 2,019 miles, 34-36-inch, crude, Edmonton to Montreal, 23,000 pump horsepower, $395 million, before Borden Commission.

Interprovincial Pipe Line Company, 350-mile extension from Toronto to Montreal, looping line from Edmonton to Toronto, crude, $240 million, considered.

Additional horsepower in four new stations and several existing stations, $9.3 million, planned.

Island Transmission Company Limited, Nanaimo, B.C., 25 miles, 10-inch, gas, from point near Vancouver, B.C. to Vancouver Island, 67 miles, 10-inch, laterals to Victoria and Nanaimo, B.C., $14 million, planned.

Mid-Continent Pipe Lines, Ltd., 1500-mile, 30-inch crude, Edmonton to Chicago, planned.

National Iranian Oil Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran, $5 million, planned.

1000 miles, 38 inch, crude, from central Iran to the Turkish Mediterranean coast, considered.

500 miles, 8-inch, products, Teheran to Meshed, Iran, contract let on 250 miles to Williams Bros. Co.

140 miles, 10-inch, gas, Gach Saran to Shiraz, Iran, contract let to Societe Entrepose and Constructors John Brown.

Pacific Petroleums Ltd., 213 miles, 3-8-inch, crude, gathering, Milligan Creek and Blueberry fields to Dawson Creek, planned.

Palestine Economic Corp., New York, 135 miles, 16-inch, crude, Eilat to Beersheba, Israel, to be completed July 1960.

Peace River Oil Pipe Line Co., Ltd., 70-mile, crude, Swan Hills to Iosegun Junction, approved.

230 miles, 8-inch, crude gathering, from fields in northeast British Columbia to Dawson Creek, B. C., and Grande Prairie, Alta., and to existing lines at Sturgeon Lake, $8.5 million, planned.

Pembina Pipe Line, Ltd., Edmonton, 1,200 miles, LPG, from Alberta gas fields to eastern Canada, planned.

Continued on Page 48

PROPOSED CONSTRUCTION

continued

Petroleos Mexicanos, 38 miles, 4 inch, products, from Mexico City to Toluca, $500,000 planned.

126 miles, 4, 6 and 8 inch, products, from Mexico City to Cuernavaca and Puebla, $2.5 million, planned.

214 miles, products, Monterrey to Torreon, $6.5 million, planned.

Pipelines of Puerto Rico, Inc., 95 miles, 8-inch, products, Penuelas to San Juan, Puerto Rico, planned.

Producers Pipelines Ltd., 25 miles, 6-inch, crude, Arlington Manor pool to Parkman pool, Saskatchewan, contract let to Majestic Contractors Limited.

Rangeland Pipe Line Company Limited, 111 miles, 8-inch, crude, southeastern Alberta to Calgary, $3 million, planned.

Sociedad Nacional de Oleoductor, 75 miles, crude, from Santiago-to-Valparaiso, $3 million, planned.

Societa Nazionale Metanodotti, 650 miles, 18-inch, crude, Genoa, to Milan-Cremona-Torino, Italy, and Aigle, Switzerland, with extensions to Karlsruhe and Munich, Germany, planned.

Societe d'Etude du Pipe Line Sud-European, Paris, 419 miles, 30-inch, crude, port of Lavera to Strasbourg, with lateral extending 40 miles to Karlsruhe, Germany, approved by French cabinet.

Standard-Vacuum Oil Company, 60 miles, 8-inch, gas, main, in South Sumatra, considered.

Ste. d-Etudes de Pipeline Intercontinetaux, Paris, 1,400 miles, 30-40-inch, gas, from Hassi R'Mel field in central Algeria across Mediterranean, through Spain, France and into West Germany, considered, Fish International Corporation making engineering and feasibility studies.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

130 miles, 16-inch, gas, main line, Multan to Lyallpur, planned.

Trans-Canada Pipe Lines Limited, Toronto, 50-mile, 30-inch, gas, lateral. Winnipeg to Emerson, Manitoba; 74 miles, 34-inch, loops, additional compressor hp at Swift Current, and Indian Head, Saskatchewan, and Portage la Prairie, Manitoba, $45 million, planned.

268 miles, 34-inch, loops, and additional hp planned for 1961, $69 million.

122 miles, 34-inch, loops, hp additions, $46 million, planned for 1962.

Trans-Prairie Pipelines, Ltd., Edmonton, crude line, from Weyburn field to Regina-Moose Jaw areas, $5 million, considered.

Crude line from Milligan Creek area to Dawson Creek and Fort St. John refineries, planned.

Union Gas Company of Canada Limited, 45 miles, 8-inch, gas, main, Stratford to Goderich, Ontario; 10-miles, 8-inch, main, to Amhertburg; 10-miles, 12-inch, lateral, Galt to Brantford, planned.

Westcoast Transmission Company, Ltd., 250 miles, 30-inch, gas, Taylor to Fort Nelson, B. C., planned.

Williams-McWilliams Industries, Inc., New York, 441 miles, 6-inch, crude, Villa Montes, Bolivia to Villa Hayes, Paraguay, considered.

Yacimientos Petroliferos Fiscales, Buenos Aires, Argentina, 621 miles, 12-inch, products, Mendoza to San Lorenzo, Argentina, $19 million, planned.

281 miles, 12¾ inch, crude, Pichanal to San Miguel Tucuman to Techint, S. A., planned.

450 miles, 16-inch, crude, from Neuquen Province to Bahia Blanca, planned.

Bids Asked on Arabian Products Pipe Line

Bids have been asked by General Petroleum Authority, Syrian Region, United Arab Republic, on construction of a 325-mile, 6-inch products line.

The line will consist of 116 miles from Homs to Aleppo; 115 miles from Homs to Damascus; and 113 miles from Homs to Lattakia. Bids should reach the General Petroleum Authority before February 29, 1960.

Rocky Mountain Firm Plans 65-Mile Line

Rocky Mountain Natural Gas Company is planning a 65-mile gas pipe line in southwestern Colorado. Gas will be used to serve Delta, Orchard City and Montrose, Colo.

Britamoil Lets Contract To Dutton-Williams Bros.

Britamoil Pipe Line Co. Ltd., has awarded a contract to Dutton-Williams Brothers Limited for construction of 40 miles of small diameter crude lines in the vicinity of Drumheller.

Husky Oil Co. Plans 100-Mile Products Line

Husky Oil Company will build a 100-mile products pipe line in 1960. The line will extend from its Cody, Wyo., refinery to Billings, Mont.

Sam Carline, Inc. Laying 16-Inch Line

Sam Carline, Inc., is laying an 8-mile, 16-inch gas line for United Gas Pipe Line Company in Terrebonne Parish, La.

Flowing Freely
With Lincoln
Diesel Welders.

You bet your profit
on your pipe laying team every time you start a job.
And the stringer bead crew is always the bottleneck. Your spread can
move no faster than the stringer beads are made.
Ok! That's the way it is—but make sure no one is waiting
because a machine is on the fritz.
Lincoln diesel engine welders give the greatest reliability under continuous,
rugged duty of *any* engine welders made anywhere.
As an old timer, *you know* this is true. If you are new to pipe line work, it
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SKINNER·SEAL
EMERGENCY PIPE CLAMPS for safe, sure lasting repair of splits and rust holes in pipe. No pressure too high. Anyone can apply in a few moments. Made in all sizes, ½" to 12", for steel and C. I. pipe. Stocked by practically all oil supply stores.

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COLLAR LEAK CLAMPS—for oil and gas lines. Gasket is sealed by gasket container rings—pressure is sealed in . . . air, moisture and gasket-destroying soil conditions are sealed out. Effective under any pressure. Sizes 2"—13" O.D. incl. In stock at oil supply stores!

For over half a century, a complete line of Repair Clamps and Saddles for steel and cast iron pipe. Send for catalog!

M. B. SKINNER CO.
SOUTH BEND 21, INDIANA

ON THE LINE

Pipe Line Welding School

Welding schools have proved to be very successful for training pipe line welders for construction work.

The Pipe Line Contractors Association has reported that results of several courses over the past two years have been very satisfactory.

The pipe line industry training school of Tulsa has graduated 45 men since November 1958.

A recent announcement has been made by Hobart Welding School of Troy, Ohio, that a special course on transmission pipe lines is now being offered. The course is open to trained and experienced welding operators only and features the downhill technique. Upon completion of the course an operator should be capable of passing the qualification section of the API Standard for Field Welding Pipe Line (1104). Final test is taken on mild steel 14-inch, schedule 30, wall thickness 0.375-inch pipe.

The length of course is normally three weeks, but it depends on the progress of trainee. For further information write Hobart Technical School, Troy, Ohio.

Needed: Someone to Provide the Facts

Natural gas industry-sponsored survey of 3,500 Americans revealed the following eye-openers:

More than 40 percent of those polled didn't care a whit whether gas utilities were publicly or privately owned. But government ownership of pipe line companies was opposed two-to-one.

41 percent favored regulation of wellhead gas—27 percent were opposed.

About 33⅓ percent knew retail gas prices are regulated. 90 percent thought wholesale prices were not controlled.

82 percent knew nothing about the depletion provision—or had never heard of it. Of the 6 percent who did know something about it, the vote was 4-to-1 in favor of keeping it as is.

From the Bureau of Indian Affairs

Changes have been proposed to amend the federal regulations on granting right-of-way across Indian lands, the Bureau of Indian Affairs has announced.

The major effect would increase permissible term on rights-of-way for pipe lines from 20 to 50 years. The amendments also would eliminate the requirement for filing with the Bureau of Land Management certain records pertaining to rights-of-way across Indian lands and would reduce number of maps that must be submitted by an applicant.

Interested parties may submit their comments on the proposals to the Bureau of Indian Affairs, Washington 25, D.C., within 30 days after publication in the Federal Register.

Peoples Forms New Company

Peoples Gas Light and Coke Company has formed a new subsidiary, Peoples Gulf Coast Natural Gas Pipeline Co., for transfer of assets of Texas Illinois Natural Gas Pipeline Co.

Texas Illinois and Peoples Gulf have filed a joint application with the Federal Power Commission seeking authorization for certain transactions necessary for consummation of the plan. The Illinois Commerce Commission has authorized Peoples Gas Light and Coke to reorganize its subsidiary, Texas Illinois. If the plan is completed Texas Illinois will be liquidated and Peoples Gulf Coast Natural Gas Pipeline Co. will operate its system.

AGA Wins Grand Award

The American Society of Association Executives presented the American Gas Association with its Grand Award "for its efforts to create better public understanding of and appreciation for the gas industry."

The executives association presented the award at its annual meeting held at Boca Raton, Fla., November 15-22.

Pipe Liners Club Officers

L. H. True, president of Magnolia Pipe Line Company, has been elected president of the National Pipe Liners Club for 1960. He succeeds J. M. Linehan of Sunray Mid-Continent Oil Co. True has been president of Magnolia Pipe Line since 1952.

now . . . longer life, improved performance for pipelines, crude units . . . with Unicor

Are you aware of the tremendous difference a small amount of Unicor can make in pipelines and crude units?

This film-forming, oil-soluble inhibitor prevents all kinds of corrosion. Wherever Unicor has plated out on a surface, it gives protection to tanks, vessels and pipelines whether full, part-full or empty.

By adding a small amount of Unicor to your product—10-20 parts to a million—you prevent product contamination, profit-robbing corrosion; assure maintenance of full-flow capacity and output.

Furthermore, use of Unicor substantially reduces filter cleaning and replacements, scraping operations, power costs and expensive downtime.

What Unicor does for tanks and pipelines it also accomplishes in crude units and other refinery equipment. For detailed information, write to our Products Department.

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UNICOR®

For more data on advertised products, use Readers' Service Cards, last page.

Steel pipe crosses the l

Into the Bush Country sixty miles northwest of Corpus Christi, Houston Pipe Line Company trucked ton after ton of Bethlehem Steel line pipe. The pipe was true to round and bevel, so there were no delays as it was welded into a continuous length and buried in the sun-baked Texas soil. Only a few days were required to build the gas-tight pipeline now stretching from the town of George West to a tie-in line 25 miles west of Beeville.

Sheppard Geiger Construction Company, Corpus Christi, tested out the line at 1,050 psi on the first try, and Houston Pipe Line Company approved it for service, reinforcing major gas supplies for Houston Natural Gas System.

BETHLEHEM BUTTWELD LINE PIPE is also popular in the wide open Southwest. Here, Highlonesome Pipeline Company, Abilene, Texas, installs 3-in. Beth-Co-Weld plain end pipe 25 miles Northeast of Artesia, N. M. Engineered and designed by the Supply Division of Bethlehem Steel Company, the surface line will be a gathering system for Utex Exploration Company and Charles A. Steen of Moab, Utah.

Bethlehem continuous buttweld line pipe, manufactured in sizes from ½ in. to 4 in. (nom.) and in various lengths, can be counted on to meet required specifications.

BIG—BUT NOT THE BIGGEST. This is 36-in. OD electric fusion-weld line pipe, made for a number of Texas-based pipeline companies at our Steelton, Pa., pipe shop. Bethlehem supplies line pipe up to 42-in. OD with walls to ¾ in.

e land of sage and sunshine

Bethlehem electric resistance-weld line pipe is a favorite down Texas way. We produce it to required specifications in sizes from 5-in. (nom.) to 16-in. OD, and in lengths to 60 ft. The steel pipe we furnished for this line was 12¾-in. OD x .250-in. wall, API 5L, Grade X-42.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

For More Dependable Equipment and Service

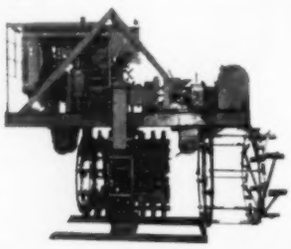
Specify

MYOCO

CLEANING and PRIMING MACHINE

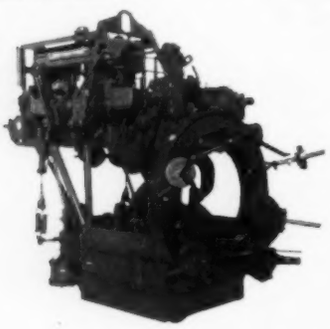
The MYOCO Cleaning and Priming Machines are available in sizes 3" thru 36". Pictured here is the 26"-32" size with two counter-rotating heads featuring the special MYOCO design counter-rotating gear box.

It is powered by an International U-9 self-starting engine and uses the Ramsey transmission. Engine exhaust is utilized to heat primer tank.



COATING and WRAPPING MACHINE

The MYOCO Coating and Wrapping Machine is powered by an International gasoline engine, with electric starter, spray type shoes, and heavy-duty transmissions and clutches. This new machine features under-pressure-crawler wheels equipped with hydraulic cylinder to maintain positive contact, easily controlled by the operator.



When you use MYOCO pipeline equipment, you quickly find that servicemen are experienced and available twenty-four hours a day with fast transportation available to serve you in any way; efficient equipment operation is assured by periodical checks; and if possible, parts and supplies are shipped the same day ordered.

MORRIS-YOUNG-OWENS CO. PIPELINE EQUIPMENT AND SUPPLIES MYOCO

MORRIS-YOUNG-OWENS CO.

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What's Happening

among MEN in the INDUSTRY

E. R. Karter

E. U. Cochrane

R. E. McGee

Harley F. Eaker

Tennessee Gas Transmission Company announces several promotions in the company's operating divisions. **Edgar U. Cochrane** has been named vice president of **Tennessee Gas Pipeline Company. Rolle Karter** has been promoted to vice president of **Tennessee Gas and Oil Company. Harley F. Eaker** becomes vice president of **Bay Petroleum Company. R. E. McGee** has been appointed treasurer of Tennessee Gas Transmission Company. Formerly chief accountant for **Midwestern Gas Transmission Company, Leroy Capps** becomes assistant treasurer and director of the budget. **Claude Lilly,** formerly Tennessee Gas personnel manager, was promoted to its director of industrial relations, succeeding Cochrane.

Cochrane, formerly director of industrial relations, has been with the company for 11 years. Karter, who has been with the firm for 13 years, formerly was Tennessee Gas internal auditor. McGee has been with Tennessee Gas 14 years and had been assistant treasurer. Formerly Tennessee Gas assistant treasurer, Eaker has been with the company 13 years.

Shell Pipe Line Corporation announces four appointments in its communications department. **J. W. LaBoon,** manager, Communications, has been named communication coordinator in Operations Department. **G. T. Kelly** will be transferred from Technical Services to assist LaBoon. **W. F. Garvin** will replace **R. L. Hauschild** as communications supervisor, Four Corners Division. Hauschild will join Technical Services February 1960.

LaBoon joined the company in 1928 as a wire chief in St. Louis. Kelly came to Shell in 1937 as assistant to the division superintendent, Texas-Gulf. Hauschild has been with the company since 1956 when he worked as junior engineer as a summer employe. Garvin joined Shell in 1951 as a transmission engineer.

Texas Eastern Transmission Corporation announces the appointment of **Oliver M. Fletcher** as acting assistant supervisor of design and construction. Fletcher has been an engineer with Texas Eastern since 1957. Prior to joining the transmission company he had been with Newport News Shipbuilding Company, Alabama Dry Dock and Shipbuilding Company, Commonwealth and Southern Corporation, Federal Bureau of Investigation and Weaks Supply Company, Ltd.

Everett B. Murphy has joined **Liquefied Petroleum Gas Association** and **Western Liquid Gas Association** staffs with headquarters in Los Angeles. He will administer WLGA's program of industry representation in behalf of California's LP-gas marketers and suppliers. As LPGA's west coast secretary he services the national association's members in California, Washington, Oregon, Idaho, Arizona and Nevada. For the past 11 years, Murphy has been with the Canners League of California as assistant secretary. Previously he held positions with the American Petroleum Industries Committee, A. C. Allyn and Co. and Western Auto Supply Co.

E. J. Wacker, Jr., has been appointed vice president of the **Magnolia Pipe Line Company.** He had been assistant to the senior vice president.

E. J. Wacker, Jr.

In addition to his executive responsibilities, Wacker will be concerned with engineering, electrical, research and other activities. He joined the pipe line company in 1939. He was appointed assistant vice president of **Magnolia Petroleum** in 1957 and in 1959 was named vice president. He became assistant to the vice president of **Mobil Oil Company,** Magnolia Pipe Line Company's parent firm, in October 1959.

John G. Smith, East Bay Division gas engineer for **Pacific Gas and Electric Company,** has been transferred to Calgary, Alberta, Canada, to assist in preparation for the Alberta-California natural gas pipe line. He will serve as executive assistant to **Charles Pennypacker Smith,** vice president and manager of **Alberta and Southern Gas Co., Ltd.**

Claude Wild, Jr., has been appointed legislative representative in Washington for **Gulf Oil Corporation.** He has been counsel for the Mid-Continent Oil and Gas Association since 1949.

S&J-

PROVEN SOURCE FOR REMOTE DATA AND CONTROL SYSTEMS

From first in mechanical gages and tank fittings—to leadership in Data Telemetering and Remote Supervisory Control. That's the Shand and Jurs story. Out of our Electrical Products Division comes S&J High Speed Telepulse for telemetering level, temperature, pressure and function control. Proven S&J Gardtrol is serving in remote supervisory control applications throughout the country. And S&J Datalogger presents the latest achievements in tank gaging automation. Remember S&J—the name to know in telemetry and supervisory control.

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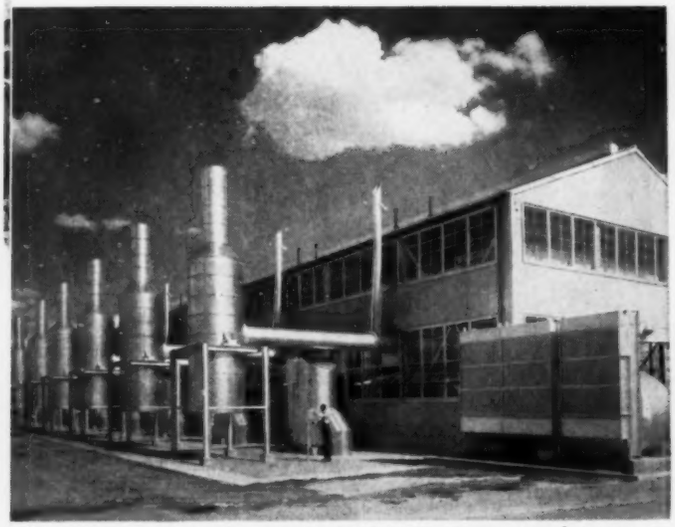
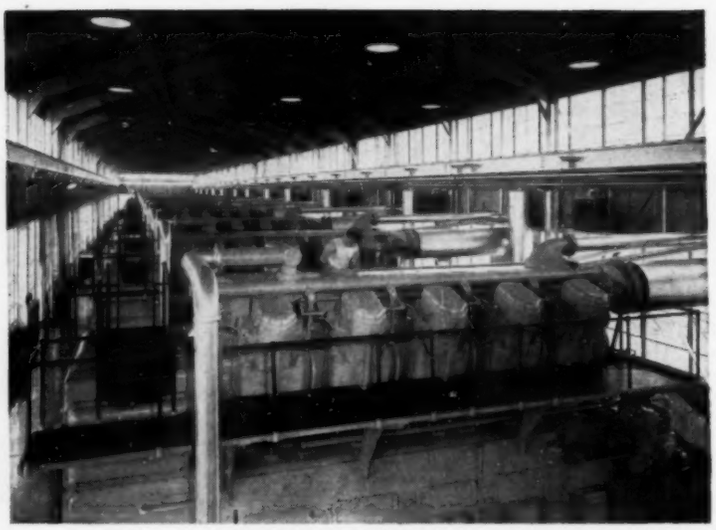
For more data on advertised products, use Readers' Service Cards, last page.



Exterior view of Edgar G. Hill Compressor Station of Michigan Wisconsin Pipe Line Company, a subsidiary of American Natural Gas Company. It is located near Guymon, Oklahoma.



General interior view of the station with the fifteen 2400 hp Cooper-Bessemer Compressors.

Harry A. Crouch, *Superintendent, Edgar G. Hill Compressor Station of Michigan Wisconsin Pipe Line Company, points out an engine feature to* Frank Tuttle, *Division Supervisor (right), and* James Davis, *Engineer (left), and explains...*

How our 15 Cooper-Bessemer Compressors have set a 10 year performance record

"On November 1, 1949, we put our first five Cooper-Bessemer Compressors on the line. Ten more were added during the next year. All 15 of these 2400 hp Cooper-Bessemer units . . . one of the world's biggest compressor horsepower installations under one roof . . . have operated 'round the clock, without interruption, averaging 72,000 to 78,000 total hours. Monthly operating and maintenance costs are averaging only $2.03 per installed horsepower.

"The fact that our Cooper-Bessemer engines have run the equivalent of 2200 times around the globe in an auto at 50 mph—a distance of over 50 million miles—points up the rugged dependability and superior design of these units. Their excellent performance record has fully justified our most confident expectations," says Mr. Crouch.

We will gladly help you assure this kind of performance for *your* compressor operations. Call our nearest office when you start planning new or expanded facilities.

BRANCH OFFICES: Grove City • New York • Washington Gloucester • Pittsburgh • Chicago • Minneapolis • St. Louis Kansas City • Tulsa • New Orleans • Shreveport • Houston Greggton • Dallas • Odessa • Pampa • Casper • Seattle San Francisco • Los Angeles

SUBSIDIARIES: Cooper-Bessemer of Canada, Ltd. . . . Edmonton Calgary • Toronto • Halifax

C-B Southern, Inc. . . . Houston

Cooper-Bessemer International Corporation . . . New York • Caracas Mexico City

Cooper-Bessemer, S.A. . . . Chur, Switzerland • The Hague, Netherlands

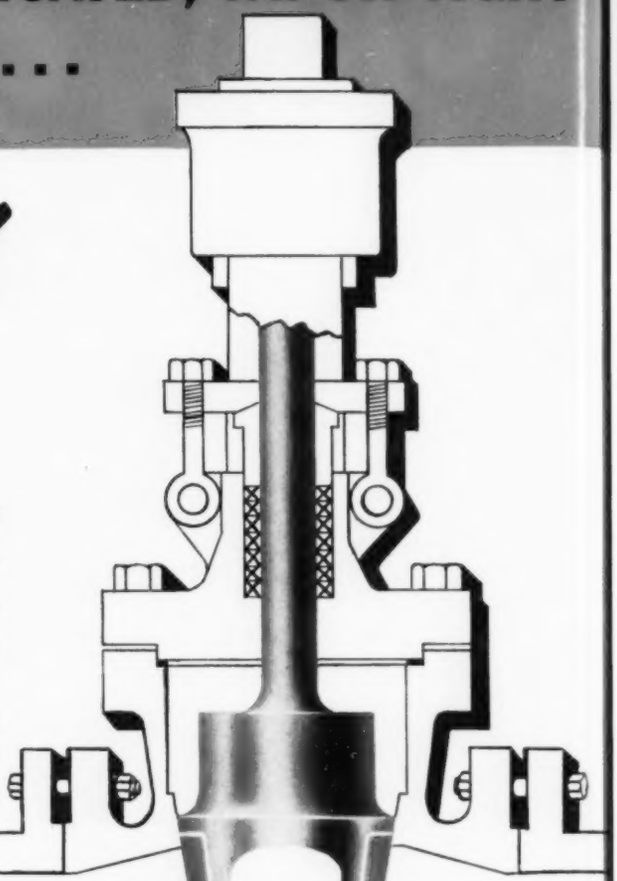
Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES: GAS • DIESEL • GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE, TURBINE OR MOTOR DRIVEN

STOCKHAM'S NEW, NON-LUBRICATED, VAPOR-TIGHT WEDGEPLUG "O-SEAL" VALVE . . .

DOES THE WORK OF 2 VALVES!



rovides Double-Block & Bleed in Most Services

ere's the valve you've been waiting for—Stockham's new Wedgeplug* O-Seal." It not only solves all your leakage problems for good **without brication**—but also does the work of 2 valves or a line blind. That's al economy!

The two Teflon† "O" rings in the plug do the trick—give constant por-tight shut-off on both the upstream and downstream seats. And e "O-Seal" is **non-lubricated**—cuts maintenance costs **from now on!**

Because of the double pressure-sealing effect of the "O" rings, the upstream seats as well as the downstream seats of this new valve hold "bubble-tight" against line pressure.

The plug in the bottom boss can be pulled to provide the **tell-tale bleed.** In extensive field and laboratory tests, this valve held bottle-tight on the upstream as well as the downstream seats when the bottom plug was removed. There is absolutely no mixing of products in manifolds.

Thus the "O-Seal" can do the job of two ordinary valves or a line blind in most services.

Your Stockham representative will advise you about the recommended services for the "O-Seal's" double-block and bleed feature.

TELL-TALE BLEED

RECOMMENDED USAGES

Stockham's new "O-Seal" is recommended for all ge services—air, gas, water, steam, propane, hydrocarb etc., as well as for hard-to-hold services. Recommende temperatures from minus 300° F to plus 400° F and not exceeding 720 psi.

Available in carbon and alloy steels, 2"- 12" sizes, 150 300 lb. pressures. Three port openings—40%, 70% round-wrench, handwheel, gear, and motor operated.

OTHER OUTSTANDING ADVANTAGES — Non-Lubricated — no costly maintenance necessary • Absolute shut-off that remains permanently "bubble tight" • Quick, easy operation—won't stick—ever • Double Seating for Double Safety— Ground metal-to-metal seat provides shut-off in case fire burns out "O" rings • No Product Contamination - Protected Seats.

*Patented
†Teflon: Dupont Tr

STOCKHAM'S NEW WEDGEPLUG "O-SEAL" VALVE

Call your STOCKHAM Distributor or Sales Representative for complete details, or write today for the new brochure on the Wedgeplug "O-Seal."

Stockham makes a *better* valve . . . for *every* job

WEDGEPLUG VALVE COMPANY *Division of* → STOCKHA VALVES *and* FITTIN

General Offices and Plant / 4063 North 19th Avenue, Birmingham 2, Alabama

The **Anchorage Gas Corporation,** formed to build a gas pipe line in Alaska, announces officers and directors of the Houston organization.

Robert B. Baldwin

Robert B. Baldwin is president. Vice presidents include **Horace B. Webb, Frank Chilson, D. N. Barrow,** and **P. F. Robison. S. Eastland, Jr.,** is secretary and **W. C. Smith, Jr.,** is treasurer.

Directors include Baldwin, **George L. Gudenrath, Smith, Webb, Jack M. Barrett, Walter J. Hickel, Dr. Asa L. Martin, Robison, Ken Sheppard, Albert C. Swalling** and **Chilson.**

Universal Engineers & Constructors, Inc., has been formed with offices at 6702 East 21st Street in Tulsa. **O. R. Burden,** president of **O. R. Burden Construction Corporation,** is president of the company. Other officers include **D. O. Givens,** executive vice president; **Vernon L. Snow,** vice president; **H. D. Peters,** treasurer, and **J. Ray Stough,** sales manager.

The company will engineer and construct pumping and compressor stations as well as work for other branches of the oil industry.

Deane Baker, formerly of Deane Baker and Associates, has joined the executive staff of **Somerville Construction Company.** Baker will work in all phases of executive responsibility from public relations to construction. Baker organized his own petroleum management consulting firm in 1927 after serving as vice president of R. H. Fulton and Company.

Allan L. Piper has been appointed manager of **Tidewater Oil Company's** eastern division Transportation and Supply department and a member of the division's operating committee.

Allan L. Piper

Piper replaces **H. F. Tomfohrde** who was named home office transportation manager at Los Angeles. Piper has been with the company since 1937. He was named assistant transportation manager for western division in 1956 and was transferred to the eastern division in that capacity later that year.

Deaths

Frank J. Trelease, 72, retired senior consulting engineer with Ford, Bacon & Davis, Inc., died Oct. 2, in Oxford, Md. He had been with the company 33 years.

Julian Nardi, 62, Ford, Bacon & Davis, Inc., chief mechanical engineer, died in a plane crash October 30 in Virginia. Nardi had been with the company for 24 years.

Testing site in Hickory, Pa. shows three compressors and three booster units in operating position. Set-up is capable of 1500 psi. Entire testing operation took but 84 hours.

COMPRESSED AIR AT 840 PSI GIVES PENNSYLVANIA CONTRACTOR:

New, economical way to test pipelines

Now, you can eliminate pipeline testing headaches, minimize costs and do the whole job faster with Schramm pipeline testing equipment. That's exactly what happened when Schramm tested a 5.6 mile section of 26" line to a pressure of 840 psi in just 84 hours for A. J. Curtis & Company on a gas pipeline for Manufacturer's Light and Heat Co., Pittsburgh, Pa. 109,000 cubic feet of pipe was tested in a minimum of time, with a minimum of operating expense and capital investment. Result: Schramm tested all remaining sections of the line.

Close-up view of boosters shows part of manifold and air line leading into the pipe being tested.

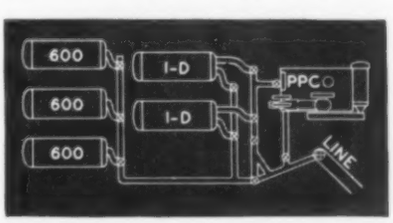


Diagram illustrates piping connections and positions of Compressors and Boosters.

Here's how it can work for you . . .

Complete package. All the equipment you need for any testing job—three Schramm 600 cfm Portable Compressors, two 1-D Booster Units and one PPC Booster Unit. Can be operated to 1500 psi.

Expertly trained operators. When you rent Schramm testing equipment, you also get the greatest amount of knowledge in the field from an operating team thoroughly experienced in pipe line testing.

Rent or Buy. Whatever your needs, occasional or constant, there's a Schramm package for you. Rent it—we'll bring it to your test site, or you can furnish your own transport. Buy it—keep your equipment right on the job for top convenience. You can use the compressors for any air requirements.

Outstanding Success. Schramm pipeline testing equipment is being used by contractors throughout the country with substantial success—in both testing results and product performance. Let us tell you more about it. Write today for your own estimating chart.

See the Yellow Pages for local Sales, Service and Rentals of Schramm Air Compressors.

Schramm, Inc.

MANUFACTURERS OF AIR COMPRESSORS

740 North Garfield Ave. • West Chester, Pa.

Here's The "Jeep" You Asked For!

AN ENTIRELY NEW LOW COST ALL-PURPOSE DETECTOR

Tinker & Rasor

MODEL E-4 DETECTOR

- Lightweight
- D. C. Output
- Shock Proof Case
- Adjustable Voltage
- Non-Destructible Type Material

The Model E-4 Detector is a portable instrument designed for all-purpose work and is adaptable to both large and small pipe. It features direct current, high potential output, accurate bell signal alarm, and is adaptable to both the full circle and half circle electrodes. It is adjustable from 5000 to 20,000 volts D. C. and offers a shock proof, non-destructible type case.

Write today for prices and complete detailed information.

TINKER & RASOR

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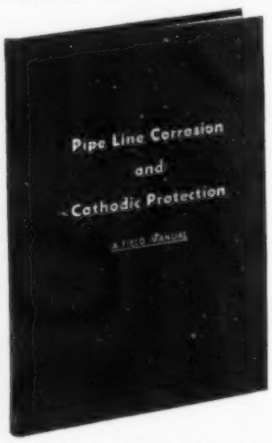

The most practical on-the-job manual for men concerned with pipe line corrosion.

Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This book is designed as a practical field manual. It provides workable methods that can save you valuable time and effort in obtaining interpretive field data.

Contents (Condensed). Soil Resistivity Surveys, Pipe-to-Soil Potentials, Line Currents, Current Requirement Surveys, Rectifier System for Coated Lines, Ground Bed Design and Installation, Magnesium Anodes on Coated Lines, Hot Spot Detection, Stray Current Electrolysis, Interference in Cathodic Protection, Operation and Maintenance, Coating Inspection and Testing.

Appendices cover: Fundamentals of Underground Corrosion, Basic Principles of Cathodic Protection. Plus . . . tables and properties of metals, attenuation equations and index.

108 pages, illustrated. . . . Price $3.00

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P. O. BOX 2608
HOUSTON 1, TEXAS

WHO'S MEETING WHERE

December

NACE, University of Illinois short course, Urbana Campus, December 7-11.

Society of Automotive Engineers, Sheraton-Cadillac and Statler Hotels, Detroit, Dec. 11-15.

1960

January

NGAA, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Jan. 22.

NACE, Corrosion control short course, University of Houston, Houston, Jan. 22-23.

Pipe Line Contractors Association, 12th annual meeting, Ambassador Hotel, Los Angeles, Jan. 31-Feb. 3.

February

Instrument Society of America, Instrument-Automation Conference and Exhibit, Houston Coliseum, Houston, Feb. 1-5.

Pipe Line Contractors Association of Canada, annual meeting, Empress Hotel, Victoria, B.C., Feb. 25-27.

NGAA, Permian Basin Regional meeting, Lincoln Hotel, Odessa, Texas, Feb. 26.

AGA, general management section conference, Pittsburgh-Hilton Hotel, Pittsburgh, Feb. 29-March 2.

March

ASME, Gas Turbine Power Division, fifth annual gas turbine conference and exposition, Rice Hotel, Houston, March 6-9.

NACE, 16th annual conference, Dallas Memorial Auditorium, Dallas, March 14-18.

NGAA, Oklahoma Regional meeting, Biltmore Hotel, Oklahoma City, March 18.

Mid-West Gas Association, annual meeting, Hotel St. Paul, St. Paul, Minn., March 21-23.

New England Gas Association, annual meeting, Statler Hotel, Boston, March 24-25.

Oklahoma Utilities Association, annual convention, Biltmore Hotel, Oklahoma City, March 24-25.

April

Florida-Georgia Gas Association convention, Biltmore Hotel, Palm Beach, Fla., April 8-9.

PIEA-PESA, Thirty-second annual petroleum industry conference and exhibition, Hotel Muehlebach and Municipal Auditorium, Kansas City, Mo., April 12-14.

BOOKS

Performance of Commercial Gas Cleaning Equipment, American Gas Association, 420 Lexington Ave., New York 17, N. Y., $2.

The American Gas Association's Pipe Line Research Committee reports results of its research project on gas cleaners for the pipe line industry. Studies were conducted to determine analytical procedures, cleaning efficiencies, oil losses, pressure drops and dust loading characteristics of six gas cleaning units now on the market. Results provide a foundation for the design and development of more efficient gas cleaners.

Pressure drops and cleaning efficencies were established for each unit, and oil losses were determined for the oil-bath cleaners. Gas thruput rates were varied from approximately 50 percent to at least 125 percent of the manufacturer's ratings to determine the effect of flow rate on these operating factors.

Standard for Field Welding of Pipe Lines, American Petroleum Institute, 50 West 50th Street, New York 20, N.Y., 50 cents.

The American Petroleum Institute Division of Transportation has published its sixth edition of the API Standard 1,104, Standard for Field Welding of Pipe Lines.

Standard 1,104 is a guide for pipe line welding procedures in the field. The principal changes in the latest edition reflect the desire of the sponsoring committee to eliminate provisions for "limited service welders."

Natural Gas and Canada-United States Relations, by John Davis, National Planning Association and Private Planning Association of Canada, 30 pages, $1.

"Natural gas today supplies about ¼ of the total energy needs of the United States and Canada . . . By 1970, it may provide as much as ⅓ of their requirements for fuel and power," states the report written by one of North America's leading energy experts.

The core of the growing question of natural gas in North America is not a problem of conservation, notes the report, potential reserves in the United States and Canada amount to "many hundreds, if not thousands, of trillions of cubic feet" . . . but the problem of "a working environment more conducive to trade."

Engineering Societies Directory, Engineers Joint Council, 29 West 39th Street, New York 18, N.Y. $3.50.

This book includes information on national, regional, state and local engineering groups. Addresses, names of secretaries, memberships and organizational publications are listed. The first revision of the book since 1956, it includes Canadian societies.

Starting of Diesel Engines at Low Temperatures, J. A. Klisch, Office of Technical Services, Department of Commerce, Washington 25, D.C., $125.

Diesel engines can be started and operated at temperatures down to —65° F if correct fuels and lubricants, adequate heating and sufficient cranking speeds are used, according to this report.

The study outlines the existing problems and the effectiveness of applied remedies associated with the operation of diesel engines at low temperatures. The information is based on both a survey of research papers and on extensive Army experience.

CORROSION IN WATER FLOOD PIPE LINES?

WATER FLOOD PIPE LINES can be protected from corrosive waters.

CEMENT MORTAR LINING of water flood lines can be done "in place."

WHERE CORROSIVE WATER is causing too frequent water line problems, Cement Mortar Lining is your answer.

And where raw water lines are being installed, Cement Mortar Linings are advisable, before the pipe goes in.

RESULT: Nuisance-free and trouble-free water pipe lines, for years.

PLUS SOMASTIC—for the best in exterior corrosion protection.

For immediate action, write, wire or phone

PIPE LININGS

Main office and plant
Box 457, Wilmington, California
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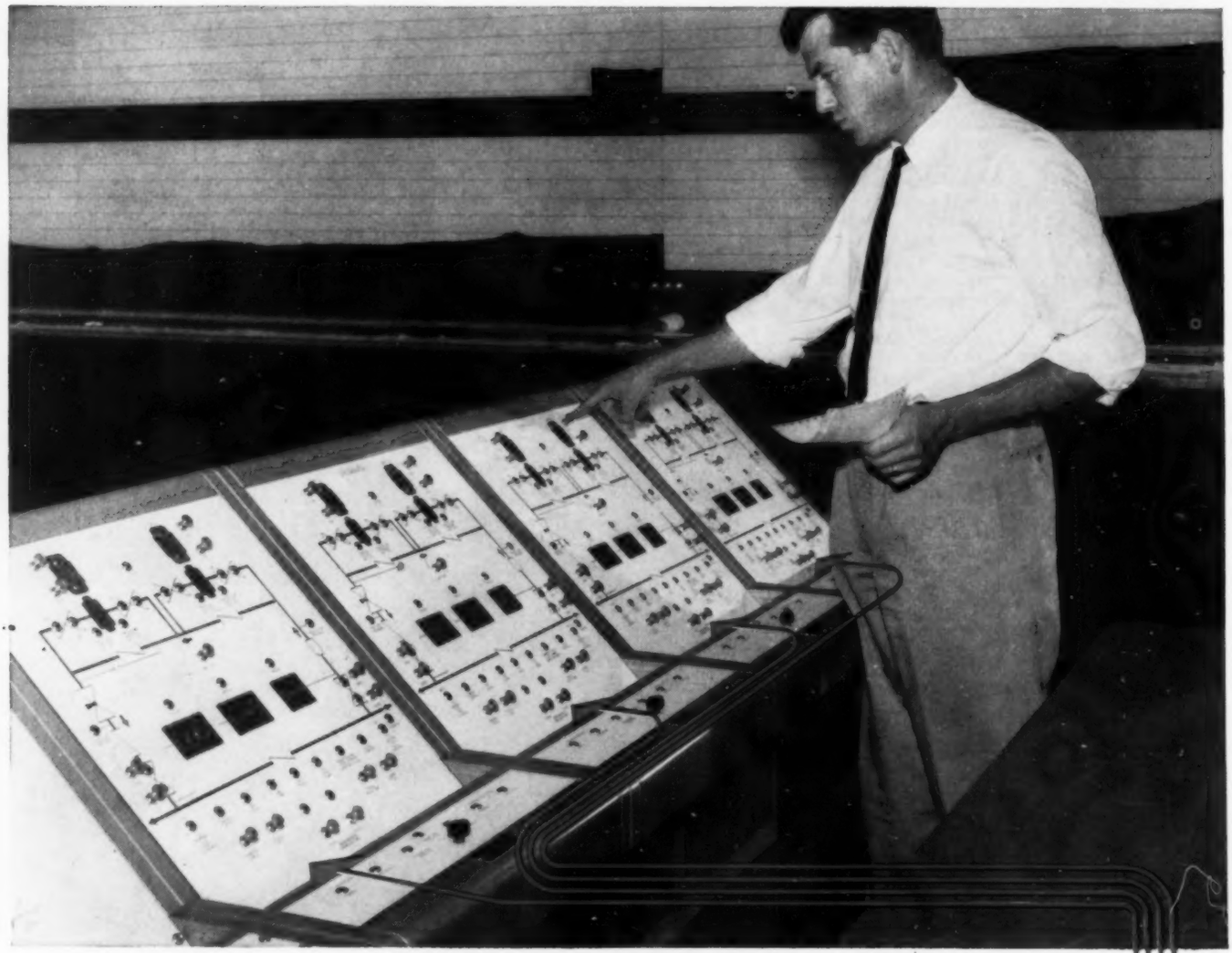
Wilmington, California
also in Fort Worth
P.O. Box 1202
Phone: Edison 5-5891

Division of American Pipe and Construction Co.

Union Centralized Transport Control pays



LOS ANGELES CONTROLLING OFFICE—The heart of the whole operation is in Los Angeles where one man at the control console can supervise the operation of four unattended pump stations 643 to 804 miles away. The operator has complete information before him showing conditions all along the line.

PHOENIX
Output Terminal

TUCSON
Output Terminal

APACHE
Unattended Booster Pump Station

REMOTE CONTROL—Either pumping unit at any one of the four booster stations can be started or stopped from Los Angeles. The sequence in opening and closing valves and starting and stopping pumps is all handled automatically and correctly by the control system.

off for Southern Pacific Pipe Lines

Push a button in Los Angeles

and four pump stations throb into action out on the desert over 600 miles away

Union Switch & Signal equipment controls operating sequence and telemeters operation of 33,000 bbl/day products line

FLEXIBILITY and fail-safe operation are the keynotes of the new pipeline system operated by Southern Pacific Pipe Lines, Inc. The line is used to transport refined products such as gasoline, jet fuel, diesel oil, etc., from El Paso, Texas, to Tucson and Phoenix, Arizona. All Centralized Transport Control equipment for four unattended booster stations was supplied by Union Switch & Signal.

REMOTE or LOCAL: All four booster stations are normally controlled from Los Angeles. Any station can be controlled locally, when desired. In any case, continuous pressure and suction readings are displayed on the console at Los Angeles and automatically recorded every fifteen minutes by an automatic typewriter. Any malfunction, at any point in the system, is indicated on the console. The equipment affected is shut down automatically and cannot be started again until the trouble has been cleared.

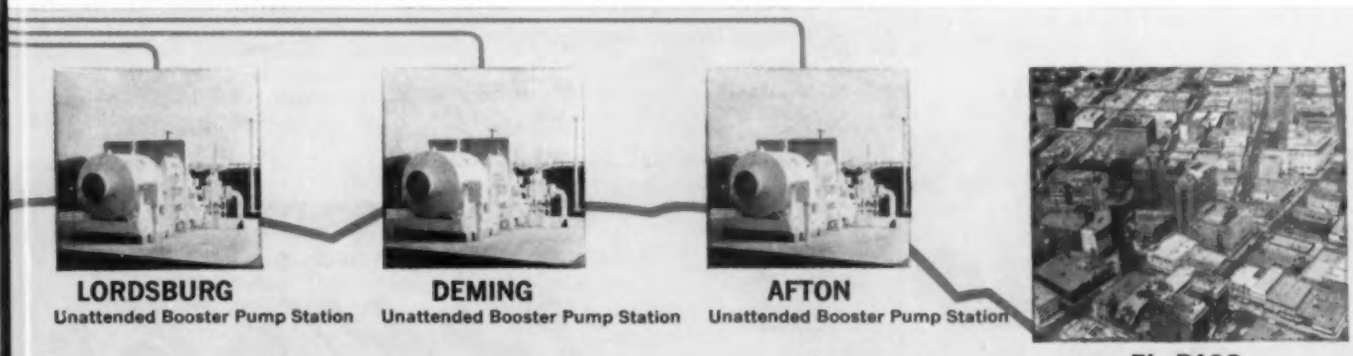
COMMUNICATION: Four telegraphic-type communications lines, owned by Southern Pacific, are used to transmit control codes to the stations and telemetered information back to Los Angeles. Each line serves one station. An additional commercial communications line serves as a stand-by for all four stations. Signals are coded to prevent noise or interference from causing faulty operation or indication.

MAXIMUM EFFICIENCY: The Centralized Control system, designed and installed by Union Switch & Signal Division of Westinghouse Air Brake Company, cuts down the chance for expensive error. It keeps the Southern Pacific Scheduling Department in Los Angeles informed, at all times, of exactly what is happening in the field. It speeds operation, adds security and reliability.

Union Switch & Signal has designed many successful custom systems for pipeline companies. And now out of that experience, it has developed standardized central control systems that cut costs, add flexibility, and save space, as well as making pipeline control extremely reliable.

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA



LORDSBURG
Unattended Booster Pump Station

DEMING
Unattended Booster Pump Station

AFTON
Unattended Booster Pump Station

EL PASO
Input Terminal

LOCAL CONTROL—Operation also can be controlled automatically at the pump station. Or the station can be run manually. The choice is up to the local station. But Los Angeles always knows which mode of control is being used and always receives a continuous flow of system information.

THE FUTURE—Southern Pacific Pipe Lines, Inc. can already see opportunity to make this system more automatic and more efficient. They plan, in time, to be able to let stations **adjust automatically** to proper unit operation when an upstream or downstream station goes off the line.

For more data on advertised products, use Readers' Service Cards, last page.

A man who's out to make a name for himself and his company – makes it a habit to read his businesspaper regularly and thoroughly. You know there's no surer way to keep abreast of what goes on in your trade or industry. No richer source of useful, usable ideas for getting ahead in your job, or in your field – than the advertising and editorial pages of . . . your businesspaper.

PHOTO ON LOCATION BY EHRENBERG

Where there's business action, there's a businesspaper

. . . where there's pipe line business there's

PIPE LINE INDUSTRY

One of a series of advertisements prepared by the ASSOCIATED BUSINESS PUBLICATONS

What's Happening among SERVICE and SUPPLY MEN

United States Steel Corporation Names L. B. Worthington President

Leslie B. Worthington has been elected president of the United States Steel Corporation succeeding the late Walter F. Munford. Worthington also was named a director and chairman of the executive committee; he will be chairman of the operations policy committee in Pittsburgh.

Worthington had been president of the Columbia-Geneva Division of U. S. Steel since 1957. Previously he had been president of the United States Steel Supply Division for 11 years. He began his career with a U. S. Steel subsidiary, Carnegie-Illinois Steel Corporation, in 1923.

Atlas Powder Company Names Wilson Field Sales Manager

Stephen M. Wilson, Jr., has been appointed field sales manager for Atlas Powder Company's Explosives Sales Department. J. W. Cochran has been named manager of Sales Department's Chicago district succeeding John F. Flippo. Flippo replaces Wilson as manager of the eastern district.

Other changes are Jack E. Downen, named manager of construction eastern area and Paul Patten, manager of construction, southern area. Willis E. Collins, Jr., becomes assistant to general manager; Henry T. Clark is administrative assistant to the general manager; William J. Taylor, Jr., director of product development; William T. Manhood, manager of national accounts; Walter L. Reinhart, manager of product application; William H. Wyman, manager of sales administrative services; David M. McFarland, technical advisor of field sales manager; and John L. Romig and John M. Jeffries, managers of special accounts.

Allis-Chalmers Names Managers Of Washington, Atlanta Districts

J. M. Duncan has been named manager of the Industries Group Sales, Washington office, and B. G. Camp becomes manager of Atlanta district for Allis-Chalmers Manufacturing Company.

Duncan, manager of Atlanta district since 1956, succeeds W. P. Bell, recently named sales manager of the company's Steam Turbine Department. Camp had been a sales representative in Allis-Chalmers Charlotte district since 1946.

Kaiser Steel Corporation Names Borden Executive Vice President

C. Fred Borden has been appointed executive vice president of Kaiser Steel Corporation. He has been vice president in charge of sales since 1950. Borden joined the sales department in 1945 and was named assistant general sales manager in 1946. In 1947 he was made general sales manager.

C. Fred Borden

Before joining Kaiser Steel, Borden had been with Columbia Steel Company for 9 years. He served as assistant to the vice president of construction.

Minnesota Mining & Manufacturing Names Joseph C. Duke Vice President

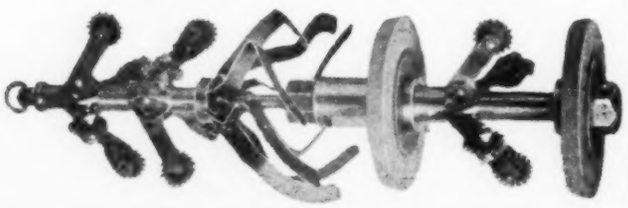
Joseph C. Duke has been appointed to the newly created position of executive vice president for sales administration and public relations for Minnesota Mining & Manufacturing Co.

Duke previously was executive vice president for the Coated Abrasives, Adhesives and Chemical divisions. C. C. Marsh, formerly vice president for coated abrasives succeeds Duke as group vice president. J. F. Whitcomb has been named general manager of the coated abrasives division.

Go-Devil

NORTHRUP GO-DEVILS

Heavy Duty Model with Neoprene cup or disc drivers



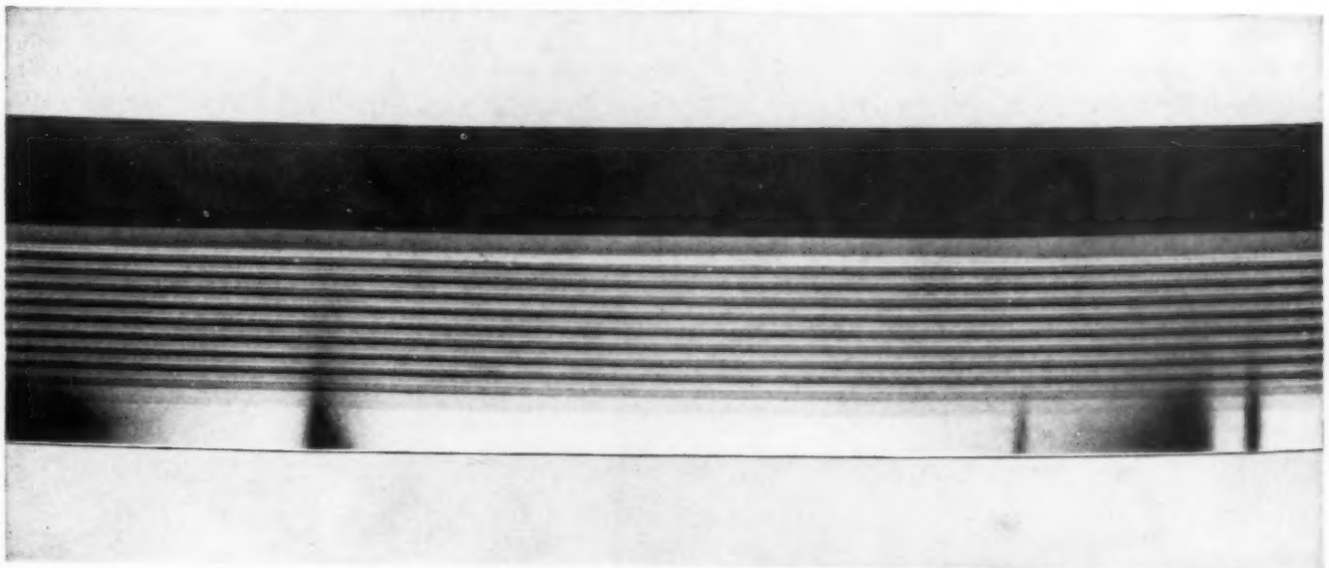
G. A. COTTEN CO.

NORTHRUP GO-DEVILS & *Manufacturers of* TRANSIT PIPE LINE SCRAPERS

P. O. Box 5332
Tulsa, Okla.

Reduce break-in time by as much as 80%!

with factory pre-seated full chrome PEDRICK PISTON RINGS



Bright highlight along lower face of ring shows area pre-seated by factory lapping.

Use of PEDRICK Chrome Piston Rings reduces break-in time by as much as 80% . . . allows the engine to be put under full load very quickly. This is because PEDRICK laps or pre-seats its Chrome Rings to cylinder size *at the factory*. PEDRICK Chrome Rings are the most modern twist-seal and/or taper face designs, which further speeds seating and helps provide a quick, positive seal.

All PEDRICK Chrome Rings have a full Chrome coating. Chrome coating on a PEDRICK Ring is never less than .006 inches and may be as much as .010 or .012 inches thick depending upon the size of the ring and the use for which it is intended. On PEDRICK Chrome Rings, thickness of the Chrome coating is measured *after* the lapping operation.

PEDRICK Full Chrome Rings resist scuffing, withstand high temperatures, abrasion and corrosion.

Include PEDRICK top Chrome Rings in your replacement ring sets and increase ring life by as much as four times. A PEDRICK engineer will be glad to call and help you solve any special problems. Write, wire or phone: WILKENING MANUFACTURING CO., Philadelphia 42, Pa., SAratoga 9-3770.

Pedrick PISTON RINGS

PEDRICK PIONEERED CONFORMABLE PISTON RINGS FOR BIG-BORE ENGINES

New BIG-LIFT, F

105 hp TD-15 Sideboom gives y

Only the new International Superior SBI-150-BH sideboom lifts 46,500 lb at 4′. It's powered and platformed by the new TD-15 six-cylinder, 105-hp Pipeliner's Special crawler!

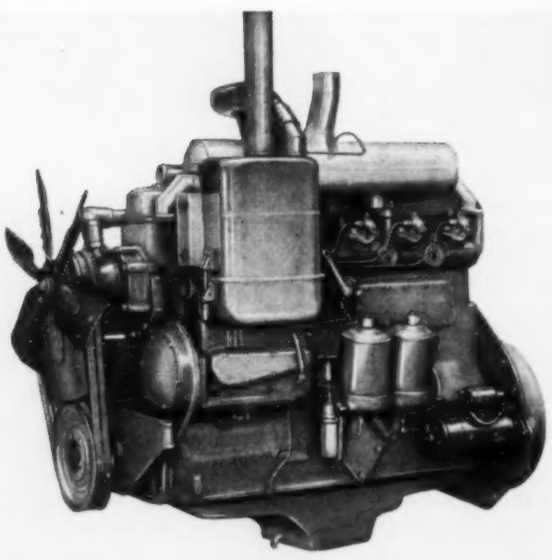
Industry-topping undercarriage strength backs the biggest lift in the 100-hp class. Precision welded box beams, joined by heavy-duty steel gussets and anchored by ¾″ steel plate, form the TD-15's Dura Roller-equipped track frames!

In the TD-15 sideboom you get a 6-speed full-reverse transmission. Change gears, and change forward-reverse directions, with one fast hand sweep of the "single-stick" shift lever and the Shuttle-Bar—to suit every job condition. Use the "15's" decelerator to position pipe with precision!

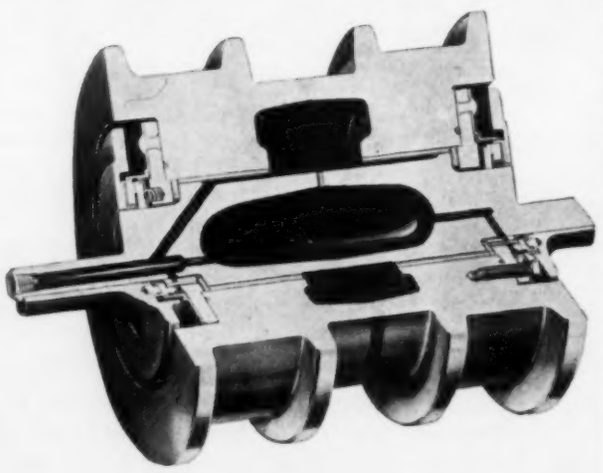
Cross-country fitness!
This 105-hp rig gives you 6-roller, rigid-track traction with 28 square feet of track-on-ground flotation—and 74″ gauge hill-hugging stability. High-clearance sideboom hinge points provide maximum clearance in soft footing. Underside design is clean. Engine and transmission guards are completely enclosed for positive protection!

Individual gear-driven drum shafts contribute to long and quiet TD-15 sideboom working life, and wear-saving cable alignment. Horizontal control levers are vertically-stacked for operating ease and safety. Fleeting sheaves prolong cable life by preventing piling or crushing. Change counterweights with speed and ease!

You get the smooth power and big-load wallop of the millions-of-hours—proved International D-554 diesel—in the TD-15 sideboom. This high-torque 6-cylinder engine develops 105 net hp at 1,650 rpm. And the TD-15 gives you the power-transfer efficiency and dependability of a *dry-type* sintered metal engine clutch that needs no "cooling system"!



Heavy-duty TD-15 1,000-hr. lube interval track rollers are designed to defy the "eat-'em-alive" pipelining "grind"! They're called Dura Rollers—feature the industry's thickest shells, king-sized lube reservoirs, and full-floating, precision-fitted seals. Pressure relief passages let you power-lubricate Dura Rollers —with positive safety to seals!

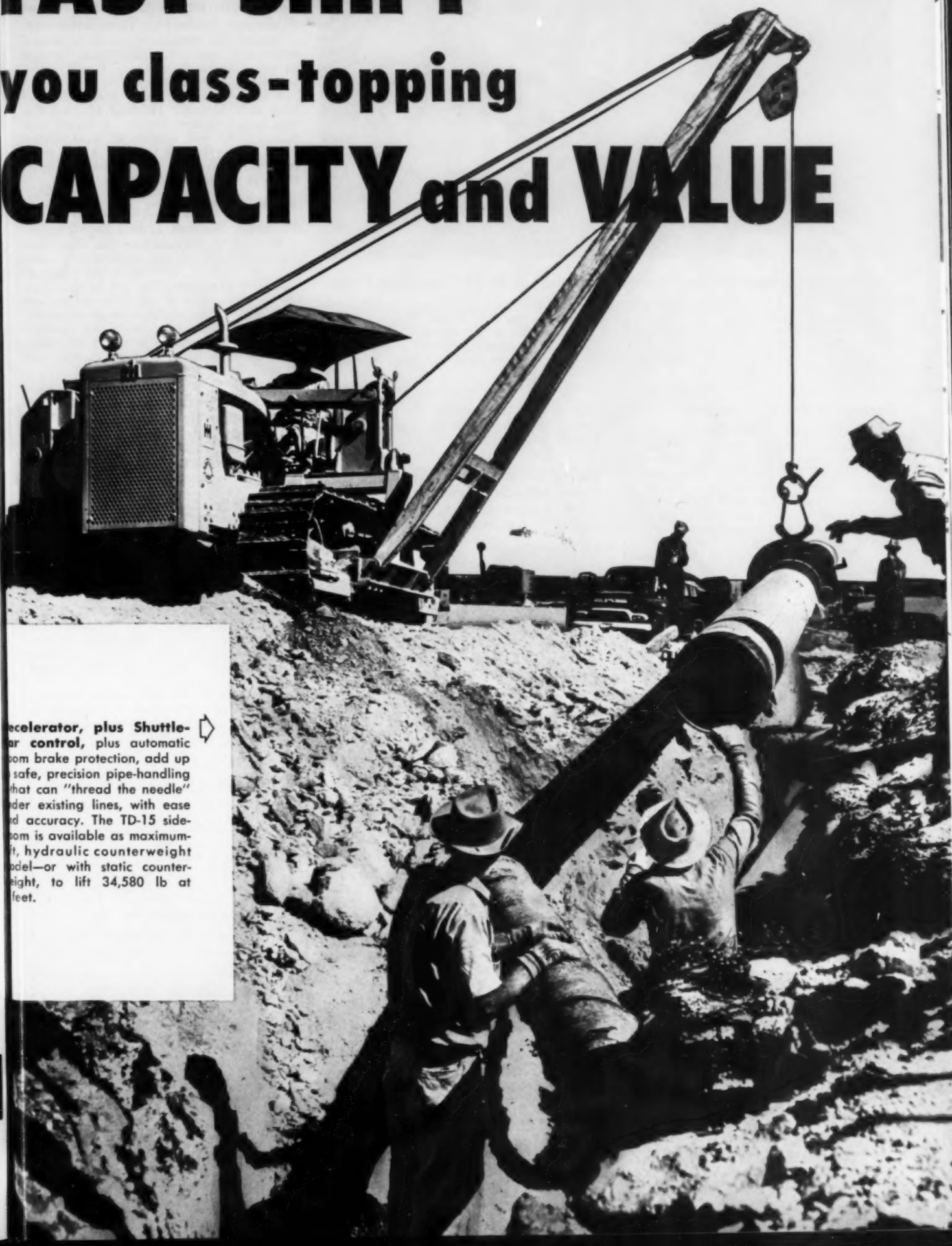


See your International Superior Distributor—measure TD-15 sideboom capacity, lowering-in pipe as big as 24″—stringing 36″ pipe—doing pipeline utility and maintenance work with stand-out speed and economy! Compare TD-15 sideboom operating ease and safety. See how this easy-to-haul, big-capacity, fast-stepping unit can "ram-rod" for a spread of king-sized booms. Ask for a demonstration!

INTERNATIONAL HARVESTER

INTERNATIONAL®
SUPERIOR®

FAST-SHIFT
you class-topping
CAPACITY and VALUE



ecelerator, plus Shuttle-ar control, plus automatic oom brake protection, add up safe, precision pipe-handling hat can "thread the needle" der existing lines, with ease d accuracy. The TD-15 side-oom is available as maximum-t, hydraulic counterweight odel—or with static counter-eight, to lift 34,580 lb at feet.

Walworth Company Completes Arrangement With Canadian Firm

The Walworth Company has made a licensing arrangement with Canada Iron Foundries, Ltd., for manufacture and sale in Canada of Walworth's valves. Pictured above completing final negotiations for the firms are, left to right, R. K. Carty, Canada Iron's vice president and general manager; J. C. Wallace, Walworth president; and R. Lyle, Canada Iron's vice president, sales. In recent years Canada Iron has been handling Walworth valves in Canada.

Caterpillar Tractor Company Will Consolidate Operations

Caterpillar Tractor Company announces that it will consolidate its domestic sales, parts, service and treasury operations in January 1960. Nineteen men, currently located in San Francisco, in the Northwest and Southwest divisions, will occupy offices in Peoria. All Northwest and Southwest division field and district representatives will continue to work in their present locations.

Crane Co. Purchases Assets Of Chapman Valve Manufacturing

The Crane Co. has purchased assets of Chapman Valve Manufacturing Company, Springfield, Mass. The plant, which will be known as Chapman Valve Manufacturing Company, will give Crane manufacturing facilities in the eastern part of the United States. The company will retain its present management and executive staff, headed by C. Goodwin Carter.

Plans for the newly acquired plant include manufacture of present line of all products now manufactured by Chapman for which there is an adequate demand.

Government Relations Engineer Appointed by Kellogg Switchboard

Kellogg Switchboard and Supply Company has appointed Emery A. Rose government relations engineer. He will coordinate government relations activities from San Francisco to Canada and east to the Continental Divide.

Rose came to Kellogg from the Ogden Ground Electronics Engineer Inst. Agency, Hill Air Force Base, Utah, where he was chief of engineering division.

Cooper-Bessemer Corp. Appoints J. M. Brannaman Branch Manager

J. M. Brannaman has been named branch manager of the Cooper-Bessemer Corporation. Brannaman will headquarter in Cooper-Bessemer's new office located in Pittsburgh's Union Trust Building.

Brannaman had been with American Potash and Chemical Corporation before joining Cooper-Bessemer. He has worked in the company's Mount Vernon, Ohio, branch office.

United States Motor Corp. Forms Sales-Service Areas

The United States Motor Corporation announces formation of new sales-service areas in the United States. In each area a sales-service organization either has been appointed or is being selected.

Robert L. Schultz

The purpose is to provide factory trained personnel for service on United States Motors products and to afford engineering assistance in planning installations. Robert L. Schultz has been appointed sales manager - distribution, to establish and train the service representatives. He will be in charge of products distribution throughout the country.

K. F. Egan Rejoins Wolverine Tube As New York District Representative

Wolverine Tube, Division of Calumet & Hecla, Inc., announces that K. F. Egan has rejoined the company as New York District representative. He will serve Wolverine accounts in the western part of New York state and will be responsible for the sale of the company's copper, copper alloy and aluminum tube.

National Supply Company Handles Union Wire Rope

Wire rope products made by Union Wire Rope Corporation will be sold through oil field sales division of The National Supply Company. The agreement covers sales through National's 112 oil field stores in the United States and Venezuela, and through 24 offices around the world.

Products included in the agreement are Tuffy rotary lines, cable tool drilling and casing lines, winch and dozer lines, rod and tubing lines, sand and pump lines, rod hanger lines and slings.

Grove Valve and Regulator Co. Names Nicholson Production Valve Salesman

Daniel Lee Nicholson has been named production valve salesman representative in the Oklahoma area for Grove Valve and Regulator Company.

Prior to joining Grove, Nicholson had been with Movable Offshore Drilling Co. and Daniel Orifice Fitting Co. In his new capacity he will handle sales of Grove production valves in Oklahoma and parts of Southern Kansas. He will be headquartered in Oklahoma City.

Pittsburgh Coke & Chemical Co. Promotes William T. McLaughlin

William T. McLaughlin has been promoted to field sales manager for protective coatings division of Pittsburgh Coke & Chemical Company. He will be responsible for supervision of the division's nationwide sales. Prior to his new appointment, McLaughlin had been protective coatings marketing manager. He joined the company in 1948 as production manager of its agricultural chemicals division.

Oakite Names Rohlfsen Manager Of South Pacific Coast Division

T. A. Ted Rohlfsen has been named manager of South Pacific Coast Division of Oakite Products, Inc., succeeding J. C. Leonard who is retiring after 35 years of service.

Rohlfsen joined Oakite in 1947 as technical service representative in Los Angeles. He will direct activities of 14 technical service representatives in Southern California's industrial community.

General Mills, Inc. Acquires Magnaflux Corporation Assets

General Mills, Inc., has acquired the business and assets of Magnaflux Corporation. Magnaflux will continue to operate under the same name as a wholly-owned subsidiary of General Mills.

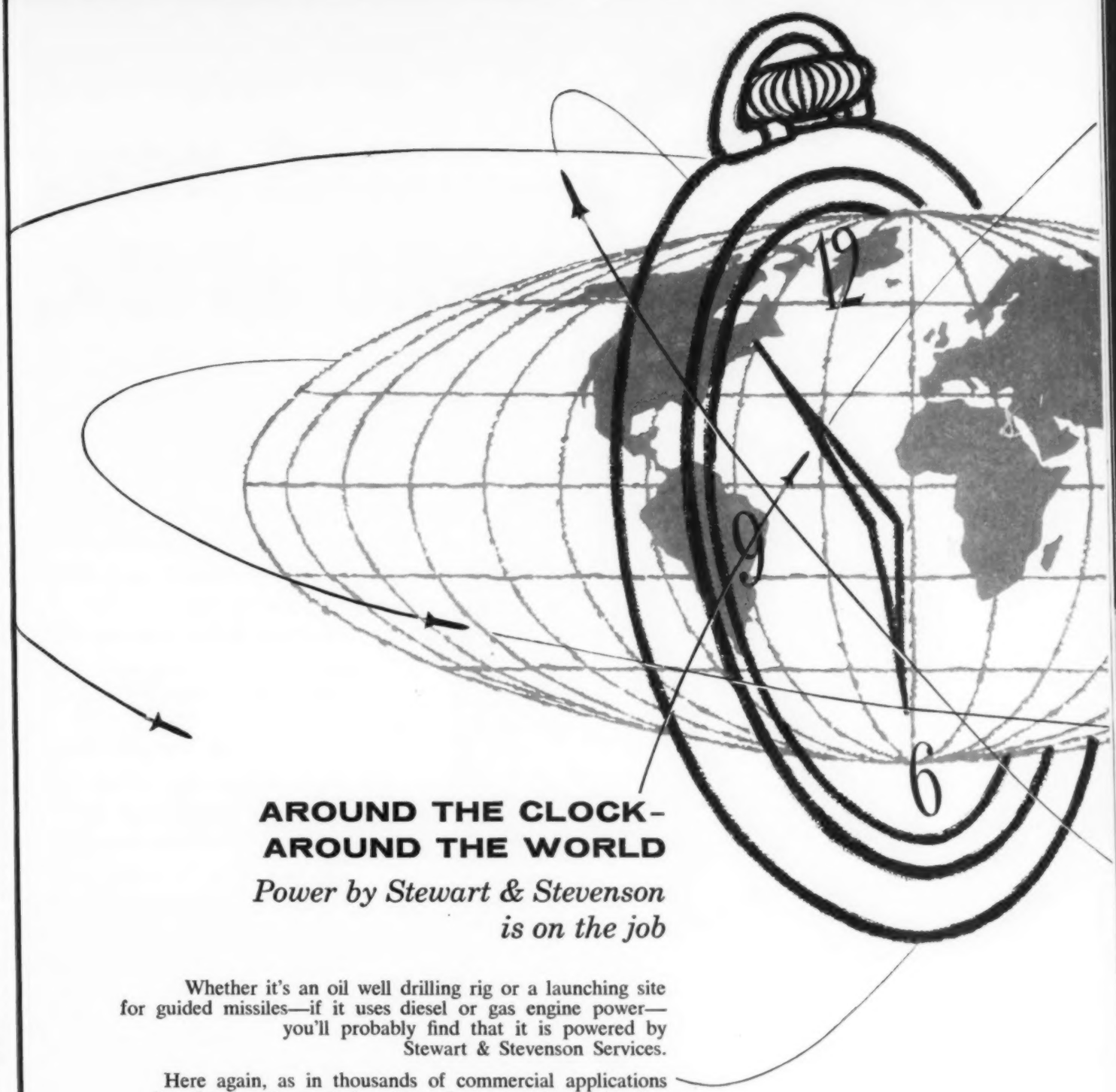
Formed in 1929, Magnaflux Corporation offers non-destructive testing systems based on magnetic, ultrasonic, electronic and fluorescent applications.

CLASSIFIED ADVERTISING

PIPE
500,000 ft. 10¾" O.D. 35#
200,000 ft. 8⅝" O.D. 28½#
100,000 ft. 12¾" O.D. 40#
20,000 ft. 16" O.D. 42#
all No. 1 grade, plain end cleaned.
INDIANA-OHIO PIPE CO.
P. O. Box 5412 Shepard Sta.
Phone C.L. 3-5527. Columbus 3, Ohio

SALESMAN WANTED

Well-established successful firm has opening in an expanding sales department for young man looking for an opportunity in sales work. Must be college graduate, not over 33, in good health, ambitious and not afraid of work. Oil industry experience desirable. The man we are looking for will be trained at home office before moving into sales work on basis of salary plus commission incentive and traveling expenses. Our own personnel know of this advertisement. Your reply will be confidential and should be sufficiently complete to merit contacting you for an interview. Address Box 56-P, PIPE LINE INDUSTRY, Houston, Texas.



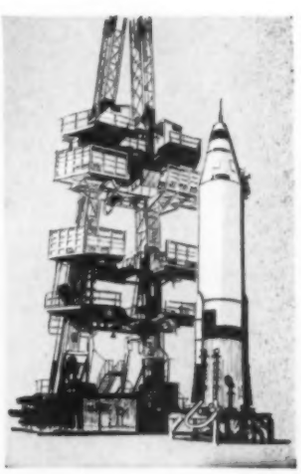
AROUND THE CLOCK–
AROUND THE WORLD

Power by Stewart & Stevenson
is on the job

Whether it's an oil well drilling rig or a launching site for guided missiles—if it uses diesel or gas engine power—you'll probably find that it is powered by Stewart & Stevenson Services.

Here again, as in thousands of commercial applications for the petroleum, industrial and construction industries, Stewart & Stevenson's experience and "know how" is paying off.

If you have a power problem—no matter how difficult or complex it may seem—it's probably "routine" with Stewart & Stevenson. Why don't you take advantage of this experience?



STEWART & STEVENSON SERVICES, INC.

Main Office and Plant:	4516 Harrisburg Blvd., Houston 11, Texas Phone CApitol 5-5341
Branches:	Corpus Christi, Dallas, Lubbock, San Juan, San Antonio, Beaumont, Odessa
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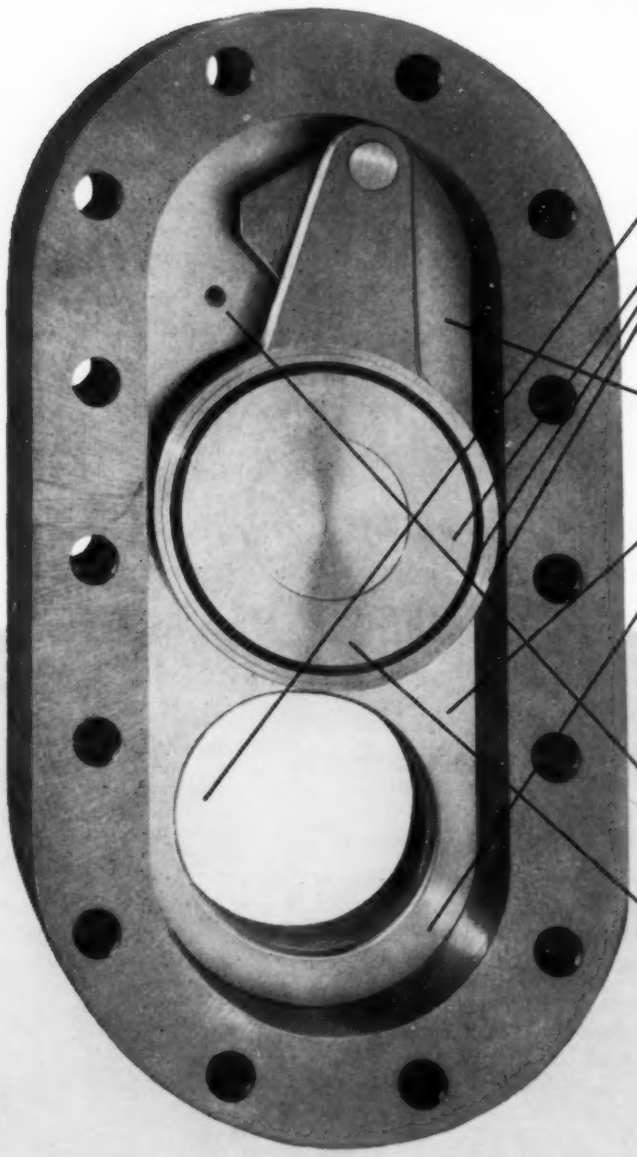
Export:	Room 1405, 74 Trinity Place, New York, N. Y.

STEWART & STEVENSON

THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

GROVE
Series
G-5

A new, with all the



Full Opening

Protected Seal-O-Ring Design—Unique Grove engineering places nitrile rubber O-rings and rugged metal seat rings on the gate, so that when in the open position, they are completely elevated away from foreign matter in the flow stream.

Continuous, Perfect Contact—Metal seat rings are firmly held in contact with polished and chrome plated body side plates to guarantee a continuous contact for scraping action through all gate positions. Squeegee action of the Seal-O-Rings maintains an immaculate surface on the side plates for perfect sealing.

No Lubrication—Ever

Bleeder Plug—Permits venting body cavity in closed position.

Springs Behind Seat Rings—Firmly hold both metal seat rings against polished body side plates.

GROVE VALVE and REGULATOR COMPANY
A Subsidiary of Walworth Corporation
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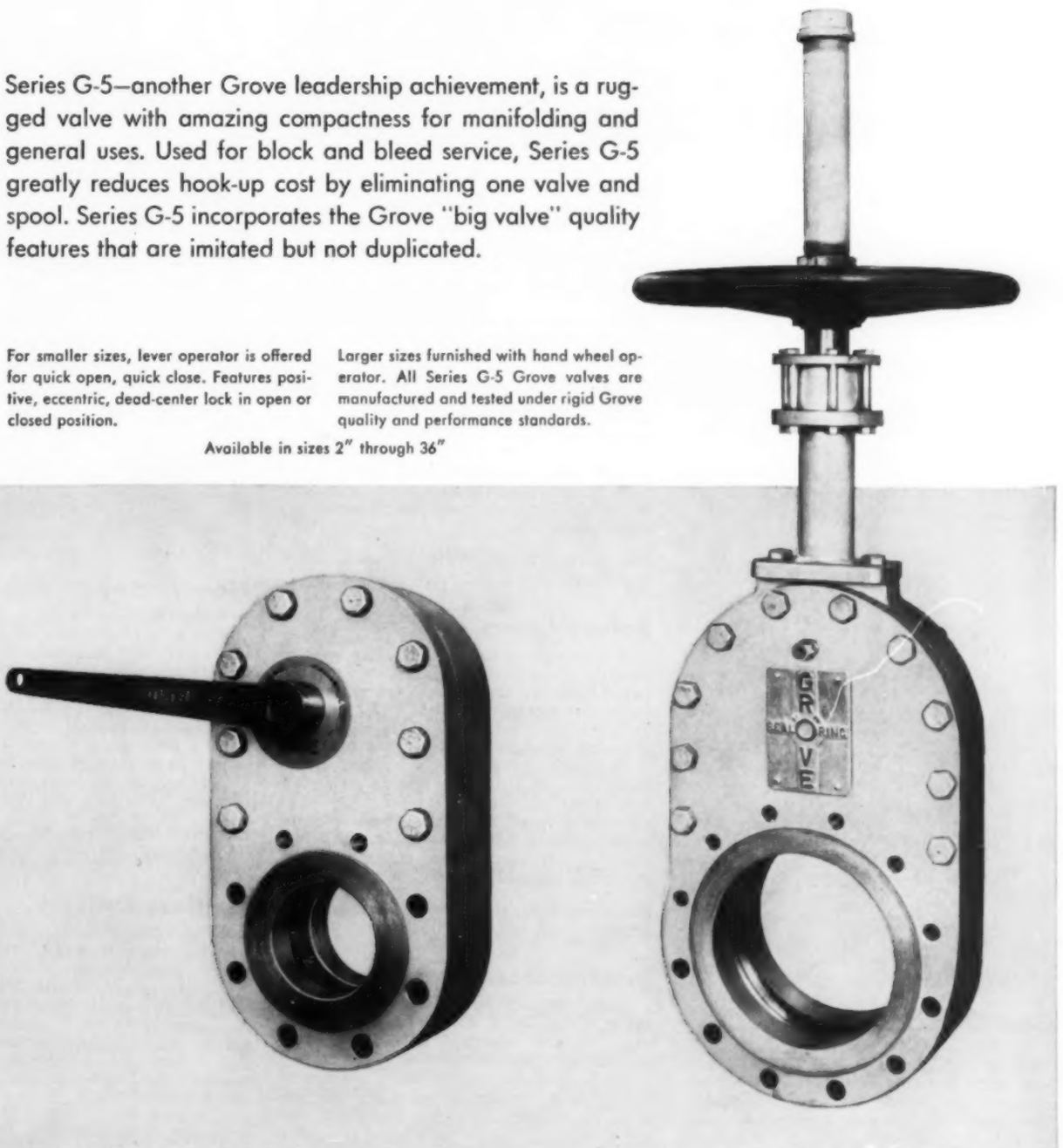
In Western Canada: GROVE VALVE LTD., EDMONTON

more compact valve proven GROVE features!

Series G-5—another Grove leadership achievement, is a rugged valve with amazing compactness for manifolding and general uses. Used for block and bleed service, Series G-5 greatly reduces hook-up cost by eliminating one valve and spool. Series G-5 incorporates the Grove "big valve" quality features that are imitated but not duplicated.



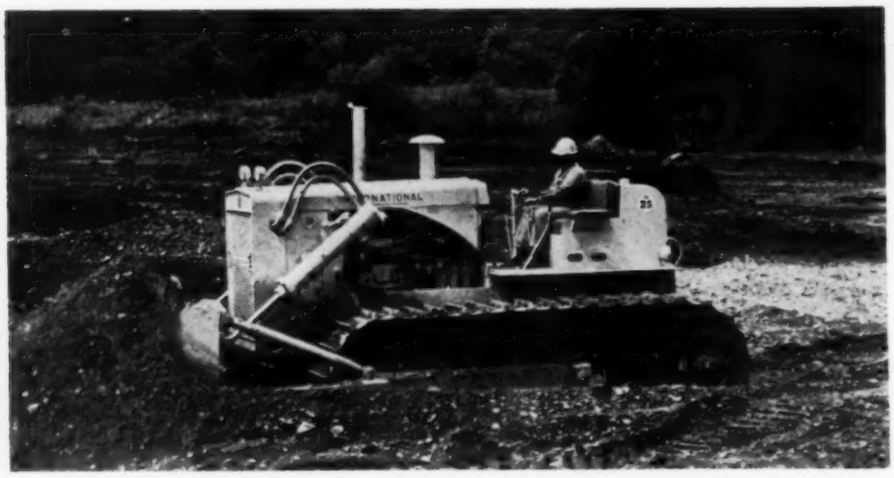
For smaller sizes, lever operator is offered for quick open, quick close. Features positive, eccentric, dead-center lock in open or closed position.

Larger sizes furnished with hand wheel operator. All Series G-5 Grove valves are manufactured and tested under rigid Grove quality and performance standards.

Available in sizes 2" through 36"

For more data on advertised products, use Readers' Service Cards, last page.

What's New in EQUIPMENT



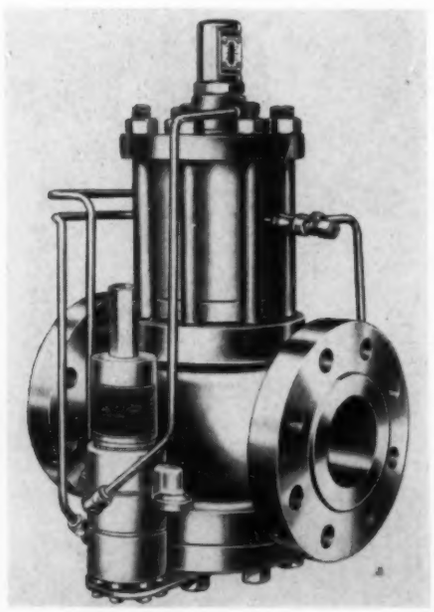
Diesel Tractor

International Harvester Company announces the availability of its most powerful crawler ever produced—the TD-25. In torque converter or gear-drive versions, both are powered by the DT-817 turbocharged engine, a six-cylinder, four-cycle, direct-starting engine developing 230 hp at 1,500 rpm.

Four speeds forward and reverse are offered by the torque converter TD-25, which has a drawbar pull of up to 70,000 pounds at .75 mph, with adequate weight and traction. The gear-drive model has a 46,700-pound drawbar pull in first gear at rated governed speed. It has eight speeds forward and reverse.

Large reservoir track rollers, Dura-rollers, have cartridge-type seals. A three-point track suspension materially lengthens the life of track rollers, track chains and pins and bushings.

For more data, circle **No. E1** on Readers' Service Card, last page this issue.



Gas Regulator

A high pressure gas regulator with tight shut-off on 1000 psi pressure drop and accurate flow control has been announced by Fisher Governor Company. The type 403 is a piston operated, single port high pressure reducing valve with specially designed composition discs and a high pressure pilot.

It is available in sizes from 1-inch to 6 inches with screwed or flanged end connections.

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

Safety Lamp

A new explosion-resistant safety lamp is announced by Burton Manufacturing Company. Designed for use in maintenance and inspection work in pipe line and petroleum industry, the jetlight features ultra-high-intensity illumination.

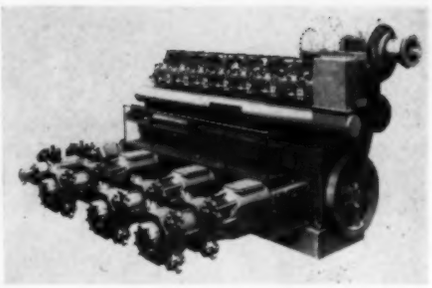
The unit, including cord and transformer, is completely sealed in heavy vulcanized neoprene rubber. The light provides relatively shadow-free spots of approximately 2,500 foot-candles at 3 feet and 1,500-foot-candles at 5 feet, with a minimum lamp-life of 100 hours.

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Intermediate Gas Engines

Built for the intermediate horsepower range, Clark Bros. Co.'s HRA-T Gas engine series is designed to save on fuel, maintenance and installation.

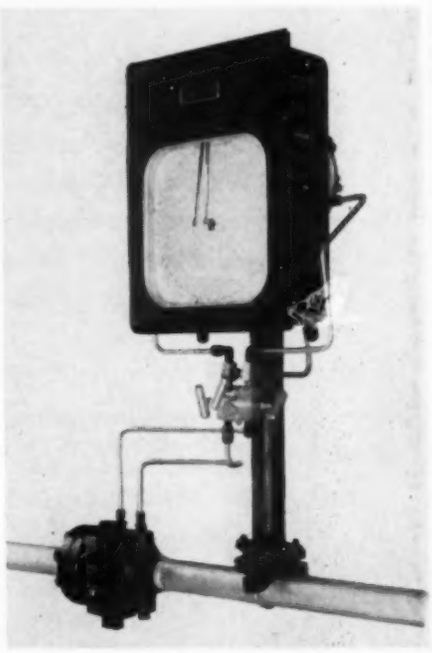
To handle heavier hp loads, crankcase, bed section, pistons, crossheads and running gear have been made larger and more rugged. The turbocharger is jet air started and completely self-sustaining at



normal operating speeds. Insulation on the fabricated steel manifold eliminates the need for manifold cooling, assures maximum turbine inlet temperature and minimizes radiation to the engine room.

(This item supplements Clark Bros. Co. data on Pages 89-92 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E4** on Readers' Service Card, last page this issue.



Flow Meter Manifold

Anderson, Greenwood & Co. has developed a new Model M6C flow meter manifold. The unit is equivalent to a 5-valve manifold and contains 2 main line shutoff valves, a double block equalizer valve and an atmospheric vent valve in a single, compact barstock body.

All valves use replaceable soft seats to assure tight shut-off and long life. Unit is light and available in carbon steel. Ratings are 5,000 psig and 200° F.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.

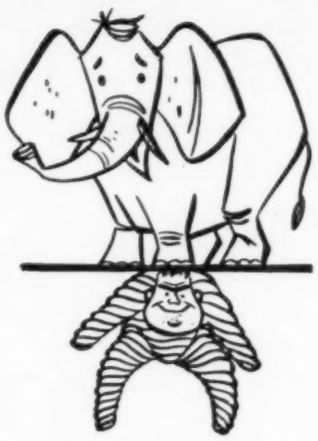
Dustless Drill

A newly developed dust collecting system for use with hand held sinker drills has been introduced by Le Roi Division, Westinghouse Air Brake Company. Dust and cuttings are trapped by a collar that fits around the drill steel and are "inhaled" through a connecting hose to a dust collecting tank. The collecting system increases air tool operator comfort and efficiency

For more data, circle **No. E6** on Readers' Service Card, last page this issue.

Tuffy Tips —on safe use of Slings and Hoist Lines

How Much Lifting Should be Done by Muscles?



Individual differences between workers make this a hard question to answer categorically. For a rule of thumb: the United States Department of Labor recommends men should handle no more than 50 pounds; women no more than 25 pounds. Of course, this is for men and women of average size and weight, in normally good physical condition. To remove all doubt, mechanical lifting and hoisting equipment should be used for all loads not comfortably lifted by muscles.

Rules to Remember For Wire Rope Safety

1. **BREAK IN** new wire rope with care. Don't use it at maximum load capacity until it is broken in beyond a doubt.
2. **OBSERVE SAFETY FACTORS.** Usually the rated load factor is 4 to 5. The Wire Rope Technical Board says 5. Elevators require 10. Static ropes — not hoisting, dragging or actively operating —may have a rated load factor of 3.
3. **LUBRICATION IS IMPORTANT** for safety, as well as for pliability and friction-fighting. Rust makes ropes brittle, and likely to break without warning. Thorough lubrication keeps out rust.
4. **INSPECT ROPES** and slings frequently for signs of serious wear. Careful inspection may save costly work stoppage or serious injury.

Sling Fittings Are Important Safety Aids

Proper fittings serve the dual purpose of greater safety and longer sling life. Fittings used on Tuffy Slings are made in more than a score of types, for every kind of service. Two of them are shown here:

(1) **EYE HOOKS:** Fittings for Tuffy Slings are selected on the basis of providing the complete unit assembly with equal breaking strength overall. Eye hooks are forged steel, weldless and designed for efficiency.

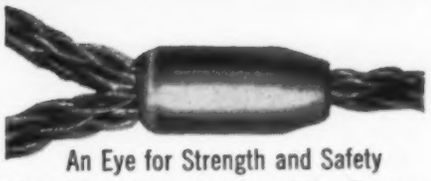
(2) **NEWCO SAFETY HOOK:** People can forget to lock a hook gate. This safety hook always remembers. A load cannot be lifted without the gate (yoke) automatically locking. To be opened, it must be manually pressed against a compression spring. We also supply this safety hook with a swivel eye for the sling. The name: Newco Safety Swivel Hook.

Tuffy Hoist Line: Stalwart Companion of Tuffy Slings

Tuffy Slings and Hoist Lines work as an efficient team on all types of overhead cranes, derricks and clamshells. Like all Tuffy Special Purpose Wire Ropes, Tuffy Hoist Line has the

right combination of strength, flexibility and toughness for greatest safety and longest service life. Use this Tuffy "team" to cut hoisting costs in every type of materials handling.

Your Tuffy Distributor Offers the Most in Service and Savings



An Eye for Strength and Safety

Slipped over the tuck-splice of the sling eye, and pressed on under tremendous hydraulic pressure, the steel ferrule holds so tight that it gives the eye splice full strength of the fabric. What's more, it is smoothly tapered to meet the main body of the sling. No abrupt edges or rough projections to injure hands and slow down work. The extra life, efficiency and safety of Tuffy's pressed-on ferrule is yours at no extra cost.

Tuffy Leads with Two Lives

"Tuffy Slings give us double the service life of ordinary slings." So reported one of the big steel corporations. The secret of Tuffy's extra life: the patented 9-part machine-braided fabric. It provides a combination of flexibility and strength never possible with ordinary wire rope.

Tuffy Takes the Danger Out of Kinks

In the first place, Tuffy Slings are not likely to kink at all. Try to kink a Tuffy. Even if you succeed with the aid of a vise, the kink can be easily straightened out with no material damage. Tuffy's machine-braided fabric won't take a "set" or deformity under the toughest of ordinary working conditions. So the danger of rope-weakening kinks is eliminated.

FREE! New Tuffy Sling Handbook

Revised and enlarged edition of famous sling manual. Covers all the bases in selection and use of Tuffy Slings and sling fittings. Gives types, dimensions, weights and rated loads. Even includes safety-approved standard signals used in operation of various equipment. Send for your free copy now. Write **Union Wire Rope Corporation, 2278 Manchester Ave., Kansas City 26, Mo.**

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UNION Wire Rope

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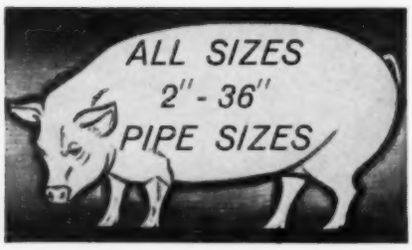
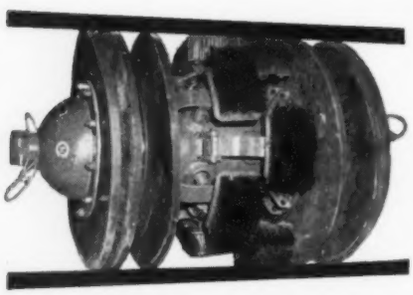
MYOCO PIPELINE PIGS



ANY COMBINATION ALWAYS IN STOCK



MYOCO S-18 COLLAPSIBLE PIG

Especially designed for use on dual diameter lines and lines with small I. D. full opening valves within collapsible range. Sturdily built of lightweight aluminum castings with spring loaded brushes and collapsible rubber discs, the S-18 assures maximum cleaning action.

COLLAPSIBLE SIZES: 36" to 30", 30" to 24", 24" to 20" and 20" to 18".

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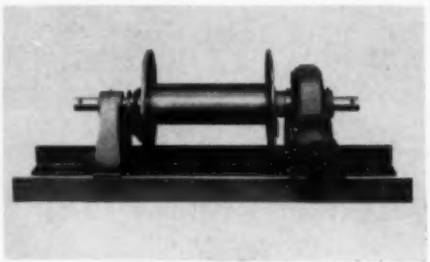
Bench and Pipe Vise

Designed for use by pipe fitters and field machinists a new combination bench and pipe vise with a throat depth of 7½ inches has been introduced by the Wilton Tool Manufacturing Co. The vise has a 6-inch jaw width, 6-inch pipe holding capacity and 10-inch opening and weighs about 160 pounds. The same type vise is available in 3½, 4½, and 5-inch jaw width sizes.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.



Truck Winches

Designed for rear-of-cab mounting on pick-ups and larger trucks, Tulsa Winch Division's new series of winches also can be installed on loading platforms, docks or other stationary locations.

The series offers increased cable capacity. Two of the models can be furnished with lever or cable controls for the clutch and/or band brake. New model is rated at 12,000 pounds line pull with a breaking point of approximately 30,500 pounds.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.

Rotary Compressor

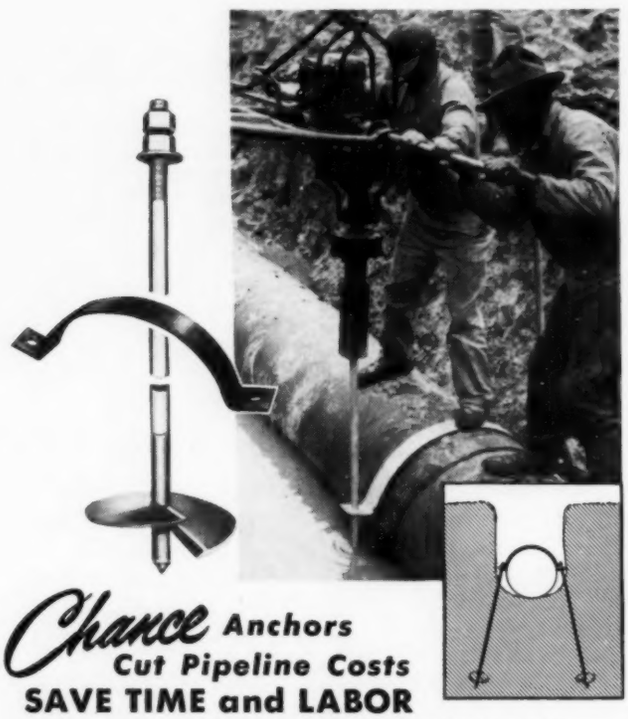
Gardner-Denver Company has introduced a new design of its 125 CFM rotary portable air compressor. Increased horsepower capacity of 15 percent improves fuel economy. The unit employs a "thriftmeter control" which automatically regulates the engine speed to meet air demand, providing economical operation, longer engine and compressor life and smooth operation.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

Vacuum Hoist

A self-contained Pad Pac unit has been announced by the Vac-U-Lift Company. With a lifting capacity of 1200 pounds, the unit is operated by a ⅓-hp Powerpac attached directly to the pad and consists of electric motor, vacuum pump, filters, muffler, gage, check valves and 3-way hand operated controls.

For more data, circle **No. E10** on Readers' Service Card, last page this issue.



Chance **Anchors Cut Pipeline Costs SAVE TIME and LABOR**

The modern, effective method of anchoring pipeline is with Chance Pipeline Anchors and Brackets. It is the lowest cost, easiest, surest way to keep pipe from floating. Can be installed with hand tools or light power equipment.

A·B·CHANCE CO. CENTRALIA, MISSOURI

A. B. CHANCE COMPANY OF CANADA, LTD. TORONTO

How to make tracks at pig-running time!

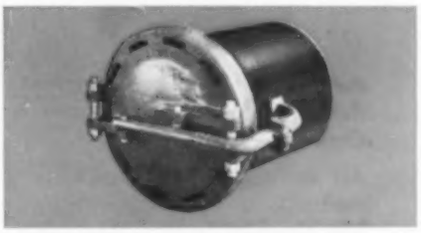
Unibolt hinged scraper traps are the answer

But not even a Unibolt Scraper Trap . . . with its easy-opening two-bolt coupling, its free-swinging hinged closure, its tight-sealing, long-lasting resilient gasket . . . can take all the work out of catching a pig. It comes mighty close, though, to making the job of starting and catching scrapers a trouble-free operation.

Unibolt originated the hinged closure to eliminate the troublesome, time-consuming multi-bolt blind flange. And the Unibolt self-sealing resilient gasket that remains in place when the closure is opened seldom, if ever, needs replacing. This saves you money as well as time. And a Unibolt Scraper Trap installed on an oversize barrel, the i.d. of which is slightly larger than the o.d. of the line, eliminates "fighting" the pig in and out of the trap. Line pressure does the heavy work.

The Unibolt Hinged Blowdown, or blowoff head, is an ideal companion to the Unibolt Scraper Trap on gas line service.

Complete details are carried in Bulletin PL-590, copies of which will gladly be sent on request.



A hinged type Unibolt Scraper Trap in closed position.

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WELDING FITTINGS

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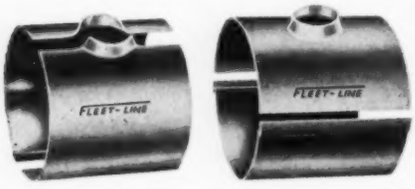
REDUCERS: Concentric and eccentric. Nominal pipe sizes 1" to 30", ASA B16.9, ASTM A234. Schedules 10 to 160, stainless steel, and other alloys. Special lengths and sizes.

SADDLES: Conventional, and for pressure vessel heads. Nozzle sizes from ¼" to 24". Fleet-Line saddles weld neatly into place in much less time, and with much less welding rod.

Full encirclement saddles.



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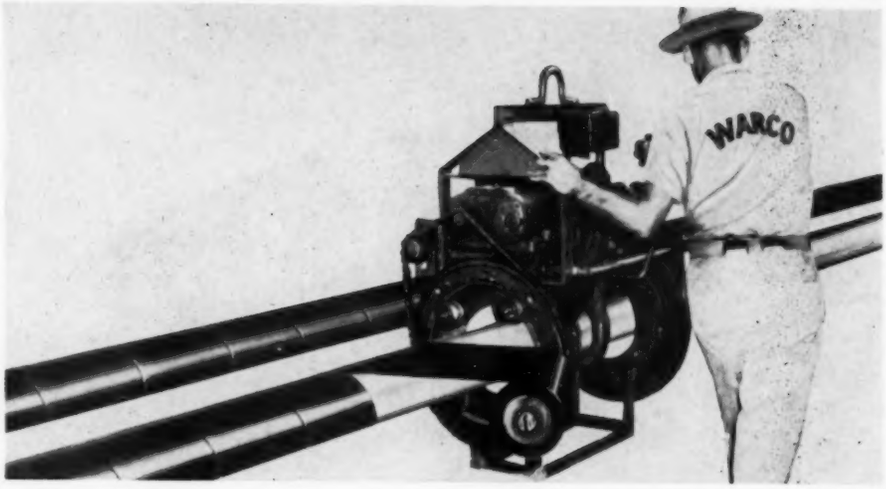
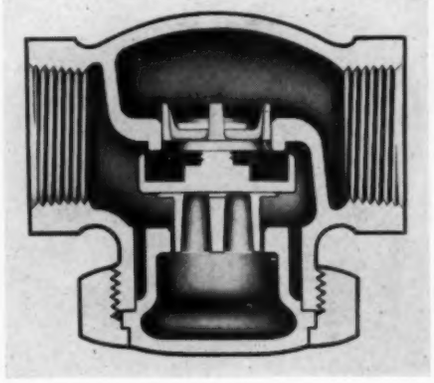


Laminated Tape

West American Rubber Company has developed a vinyl and butyl laminated pipe wrap for corrosive protection. The heavy butyl layer provides a permanent seal which fills pits and prevents moisture migration at the overlap. The outer cover of vinyl provides high resistance to corrosion.

A special primer is used in applying the tape. The tape is available in a wide range of thicknesses and widths.

For more data, circle **No. E11** on Readers' Service Card, last page this issue.



Bronze Valves

Crane Co. has introduced two new lines of bronze valves, No. 229C 200 pound globe valve and No. 239C 200 pound lift check valve. These valves replace the former 212C and 218C valves.

The new valves have integral body seats with a semi-crown face instead of screwed-in seats as was the case in the valves they replace.

(This item supplements Crane Co. data on pages 121-136 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E12** on Readers' Service Card, last page this issue.

Suction Pumps

Designed to permit quick removal of the entire suction chamber and liner plate without removing the volute, Jaeger Machine Company introduces its new intermediate and 3-inch contractors pumps.

The model 3PN will pump all the water a 3-inch suction hose can handle at 5-foot lift. The pump is 30 pounds lighter than previous model. It is powered with Wisconsin AGND engine having removable aluminum cylinder head, stellitefaced valve and insert and positive valve rotators.

For more data, circle **No. E13** on Readers' Service Card, last page this issue.

Bevel Grinder

The Bev-L-Grinder, designed to make on the job accurate weld bevel preparation on 6 to 18-inch pipe, has been developed by E. H. Wachs Company.

The grinder head can be set 20, 37½, and 90 degrees by a locking pin in the motor support. Operator simply rotates grinder head around a self-centering spindle. Guarded 6-inch cupped grinding wheel is powered by a 6,000-rpm air motor.

(This item supplements E. H. Wachs Co. data on Page 521 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E14** on Readers' Service Card, last page this issue.

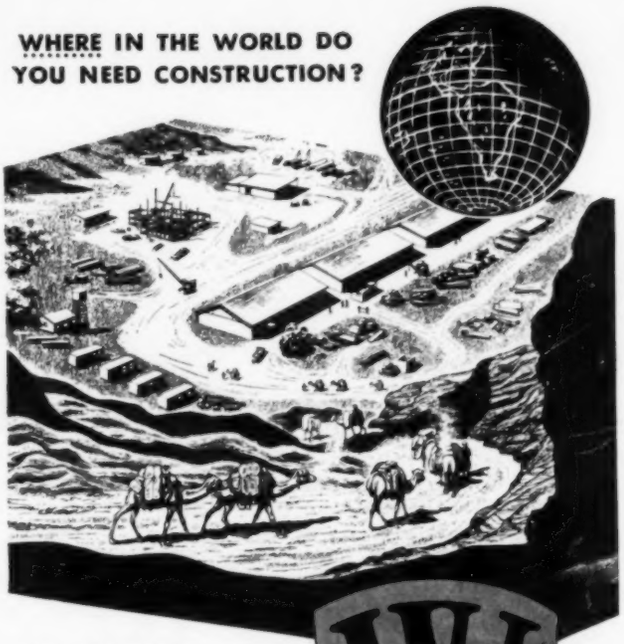
Solid-State Computer

Remington Rand Univac Division has developed a solid state, digital computing system. Data processing and scientific problems can be performed concurrently by the Larc.

Magnetic core units store up to 97,500 words, while new high speed drums store up to 6 million words. These are supplemented by the enormous storage capacity of up to 40 magnetic tape servos.

For more data, circle **No. E15** on Readers' Service Card, last page this issue.

WHERE IN THE WORLD DO YOU NEED CONSTRUCTION?



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Here's a demulsifier that has been tested from Canada to the Gulf with the following advantages:

1. UNIVERSAL TREATING COMPOUND . . . successfully treated different types of emulsified conditions in all areas tested.
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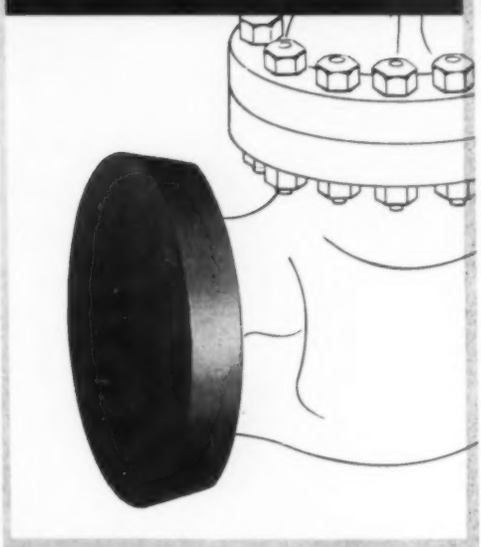
COVERTITE SEAL COVER



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Wherever dust and end protection is needed, COVERTITE—the versatile slip-on seal cover—is your answer. The exclusive **bead-grip** feature guarantees a complete seal every time. These soft neoprene elastic covers, available in all sizes, easily stretch over the outside diameter of any ASA flange and are perfect for pipe or tubing. COVERTITES are highly recommended for protection during manufacturing or shipping and for protective maintenance on all equipment utilizing ASA flanges. Our engineering staff is available for your specialized cover problems.

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Pipe Line construction and service items listed in PIPE LINE CATALOG exceed 400…an invaluable aid to office and field specifications and purchases.

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When you are ready to buy or specify, or if you just want planning information, look first in PIPE LINE CATALOG.

New Equipment Literature

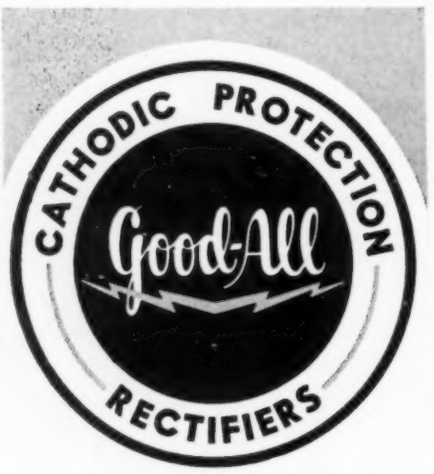
For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers' Index. Simply circle code numbers of items desired—sign and mail card.

12-Inch Recorder

A redesigned 12-inch recorder for temperature and pressure has been introduced by U.S. Gauge, Division of American Machine & Metals, Inc. Rear of case has a recessed bottom that permits one type of connection for both wall or panel mounting. A large opening in the door provides improved visibility of the chart.

Up to four recording pens can be provided on the new instrument, for temperature, pressure or a combination of the two variables. Ball pivoted pen movements minimize friction and wear. Filled-system thermometer elements can measure temperatures from —300° to 1200° F.

For more data, circle **No. E16** on Readers' Service Card, last page this issue.



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"AMP-O-MATIC"

Rectifier. Just set it and forget it . . . the Amp-O-Matic automatically ADJUSTS OUTPUT ITSELF!

GOOD-ALL ELECTRIC MFG. CO.
OGALLALA, NEBRASKA

Tube Fittings

The Weatherhead Company has published a catalog containing easy to find, listings of brass and steel tube fittings, tube working tools, hose, hose ends and assemblies most frequently used in hydraulic and pneumatic systems.

The 16-page, two-color catalogue contains illustrations of the individual fittings.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Branch Connections Fittings

W-S Fittings Works, Forge and Fittings Division, H. K. Porter Company, Inc., is offering an illustrated 16-page booklet describing the application and benefits of the W-S Fishmouth.

The bulletin covers cost comparisons, engineering design data, points of practical use and major advantages to contractors.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

Computer Compiler

Royal McBee has published a 20-page brochure on its Act 1 compiler for the Royal Precision LPG-30 electronic computer. Programming with the compiler can be learned in a single day. Any problem can be submitted to the computer in simple algebraic form. The compiler is fed into the LPG-30's 4096-word internal memory on punched tape, and translates problems to the machine language automatically.

To get a copy, circle **No. E19** on Readers' Service Card, last page this issue.

Complete Recording Line

Providing buying information on complete line of recording instruments, including dimensions and chart speeds, operating specifications, applications, features and accessories General Electric has issued a 12-page bulletin.

Photographs of all models discussed are included and bulletin also describes specialized recording instruments available.

To get a copy, circle **No. E20** on Readers' Service Card, last page this issue.

Power Houses

A new booklet has been published describing in English, German, French and Spanish recently erected Deutz diesel-electric power houses. The booklet includes photographs and also a complete power house layout drawing for a typical three power unit installation. Diesel Energy Corporation announces availability of the bulletin.

To get a copy, circle **No. E21** on Readers' Service Card, last page this issue.

Isotopes

"Industrial Radiography With Radioisotopes," is the title of a 12-page booklet released by Picker X-Ray Corporation. The booklet describes and explains equipment and methods of radiographing all kinds of industrial products.

The illustrated booklet discusses selection of the proper isotope for a particular job and methods of making radiographic exposures. It contains a "chart of equivalent energies", showing typical exposure times required to radiograph various materials of varying thicknesses with some of the popular isotopes.

To get a copy, circle **No. E22** on Readers' Service Card, last page this issue.

Crawler Tractor

International Harvester Tractor Company features its TD-9 tractor in a 16-page 2-color catalog. The unit has a 55.7 drawbar horsepower, five roller track frame, a five forward-speed and one reserve-speed transmission, a six-cylinder turbocharged 66 net horsepower diesel engine, push button direct starting and new 500-hour lubrication period track rollers.

New undercarriage components increase track life and working output.

To get a copy, circle **No. E23** on Readers' Service Card, last page this issue.

Electric Plants

D. W. Onan & Sons Inc., has released a bulletin on its line of diesel engine-driven electric generating sets. These units provide continuous source of electricity for all types of operation. The 4-page, 2-color folder includes specifications and illustrations of these compact sets, in sizes from 3,000 to 6,000 watts (air-cooled) and from 10,000 to 230,000 watts (water-cooled).

To get a copy, circle **No. E24** on Readers' Service Card, last page this issue.

Coal Tar Epoxy Coatings

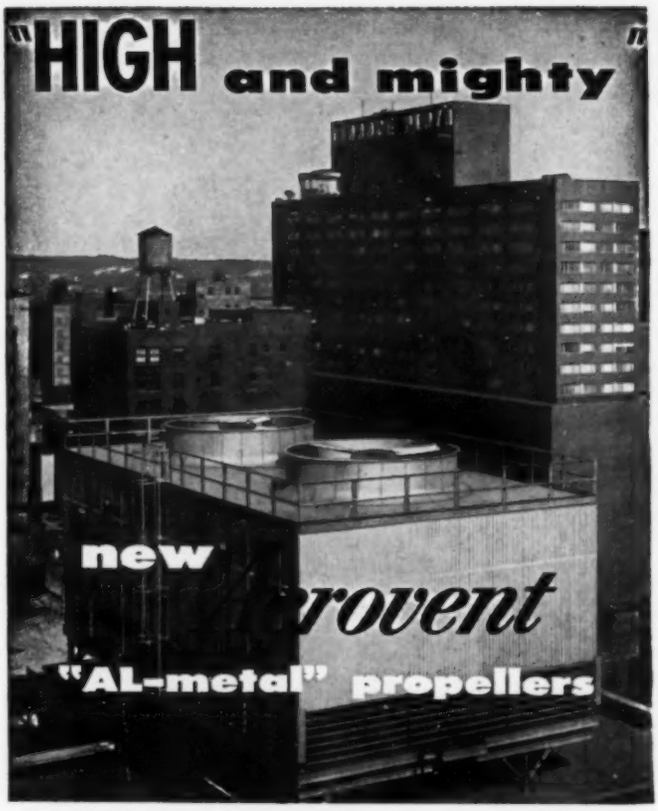
Amercoat Corporation has published a compilation of 17 laboratory tests on coal tar epoxy coatings exposed to various corrosive solutions and environments. Tests include salts, acids, caustics, bleach, petroleum products, distilled water and weathering. Comparative performances of four epoxies are illustrated and described.

To get a copy, circle **No. E25** on Readers' Service Card, last page this issue.

Rectifiers

Corrosion Rectifying Company has released a 4-page bulletin on its rectifiers. The bulletin includes descriptions and illustrations of air-cooled rectifiers, oil-immersed rectifiers and sentinel the Jr., rectifier. Rectifiers are constructed for use on pipe line, oil well casing or offshore work.

To get a copy, circle **No. E26** on Readers' Service Card, last page this issue.



move mountains - of AIR!
in towers and exchangers

- Sizes 14' to 18'
- 4 or 6 blades

Developed originally for the petroleum industry, Aerovent Large-Diameter "Al-metal" Propellers, constructed of tough, durable aluminum alloy, move great quantities of air at high velocities, in heat exchangers and cooling towers. Pictured above are two 4-blade, 16-ft. propellers in a cooling tower installation. These mighty propellers, with adjustable-pitch "Macheta" Airfoil blades, are job-engineered to individual specifications.

Write for free Bulletin 510

DESIGNED FOR DEPENDABLE OPERATION!

Endurance tests, conducted at *3 times* normal loading prove the ability of these new large-diameter propellers to withstand severe punishment. Heavy-duty cast steel hubs offer maximum resistance to stresses. Angle settings for each operating requirement, and appropriate alternate settings, assure accurate pitch for any predetermined performance which may be required. 54" to 144" now available in Adjustable Pitch Models.

REFINERIES, pumping stations, industrial plants and commercial buildings use Aerovent "Al-metal" Propellers in major air-moving applications.

Aerovent FAN COMPANY, INC.
LARGE PROPELLER DIVISION
304 Wright Bldg.
TULSA 3, OKLA.
Main Office and Factory
PIQUA, OHIO

As SIMPLE and Dependable as the Pull of a MAGNET!

A sleeve, raised and lowered within a non-magnetic tube, attracts or releases an Alnico magnet attached to a mercury switch. Basically, this is Magnetrol.

MAGNETROL

The Simplest, Most Versatile LIQUID LEVEL CONTROL Ever Devised!

Linked to liquid level by infallible magnetic force, Magnetrol is free from the limitations inherent in mechanical or electrical controls. With the actuating magnet rated at 98% of initial strength after 30 years, Magnetrol has *infinite operating life,* with practically no maintenance at all. There are no wearing parts to get out of order.

What's more, Magnetrol's simple operating principle permits easy, economical modification of standard units to meet *any* pressure, temperature or corrosion requirements. That's why there's practically no limit to Magnetrol's use. It's also why "specials" are likely to be standard with us. Magnetrol units control level changes from .0025-in. to 150-ft. —with single or multi-stage switching.

MAGNETROL, Inc.

● SEND COUPON FOR DETAILS

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Please send me catalog data and full information on Magnetrol Liquid Level Controls.
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Company_____
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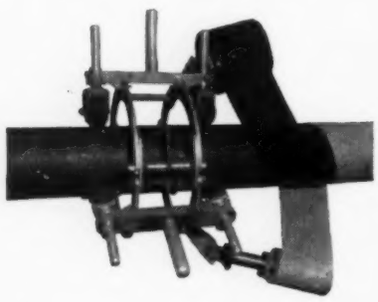
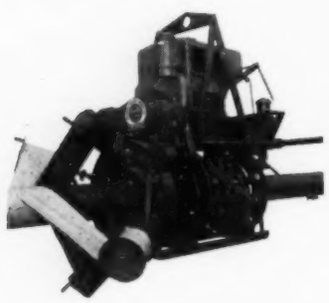
MYOCO...

For More Dependable Equipment and Service

HERE ARE MACHINES THAT BRING ADDED EFFICIENCY TO YOUR TAPING AND CLEANING AND TAPING.



The MYOCO Tapemaster can use four arms to give any combination of tape and kraft or felt. Six various size machines available for ½" through 36" pipe; small machines use tape from ½" width through 9", large machines use 9" through 18" tape.



MYOCO Model OW Power Driven Cleaning and Taping machine combines two operations for increased speed of operations with less equipment. Line travel machines are available to handle pipe sizes 3" to 6", 6" to 12", and 14" to 20". A Wisconsin Model Vg4D V-type 4-cylinder heavy-duty air cooled engine, combined with the design and engineering features of this machine, guarantees uninterrupted service.

When you use MYOCO pipeline equipment, you quickly find that servicemen are experienced and available twenty-four hours a day, with fast transportation available to serve you in any way; efficient equipment operation is assured by periodical checks; and if possible, parts and supplies are shipped the same day ordered.

MORRIS-YOUNG-OWENS CO. PIPELINE EQUIPMENT AND SUPPLIES MYOCO

MORRIS-YOUNG-OWENS CO.

PIPELINE EQUIPMENT AND SUPPLIES

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In Canada: MYOCO LTD., 30 Bloor St. West
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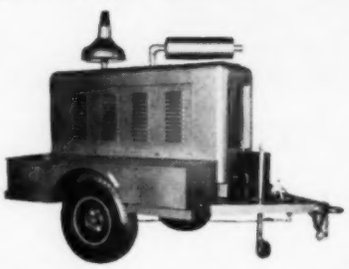
There's VERSATILITY in your PIPE LINE SERVICE and ***Portability*** *with...*

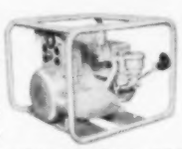
U.S.

Portable U.S. Versa-Trailer standby emergency power units in sizes from 10 kw to 35 kw capacity provide single phase power for lights and 3-phase power for other requirements.



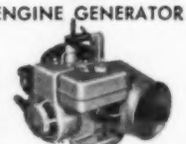
Versatile mobile power units provide for foolproof selection of desired current with selector plugs and cables.

Pipe Lines use convenient lightweight generating sets for lights, portable tools. Rugged construction.



ENGINE GENERATOR

Portable blowers are especially suited for ejecting smoke, fumes, stale, contaminated air, and for purging tank cars, field storage tanks, etc. Motor driven or engine blowers are available.



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WHAT 44 YEARS OF *Leadership* MEAN TO PUMP USERS

"A good example of an oil field pump which sees a great deal of use in this (gathering line and small trunk line) service is the Gaso Figure 1742 2½-5½ x 10."

From the Book
"HYDRAULICS FOR PIPELINERS"
by C. B. Lester

Let's examine the word "Leadership" and what it means to the user of any product.

Leadership is positive proof of **superior performance.** How else would you explain the preference that creates leadership?

Leadership identifies a manufacturer who keeps pace with the changing needs and conditions of his customers, and a product that embodies the latest advances in design and construction. How else can leadership be maintained?

GASO's leadership in its field, stretching over a period of 44 years, is built on a foundation of experience, concentration, research and service, all leading to the kind of performance exacting users look for in pipe line and water flooding operations.

This and this alone explains why Gaso Pumps are a standard specification in the buying policies of so many progressive oil industry companies.

May we send you our latest catalog?

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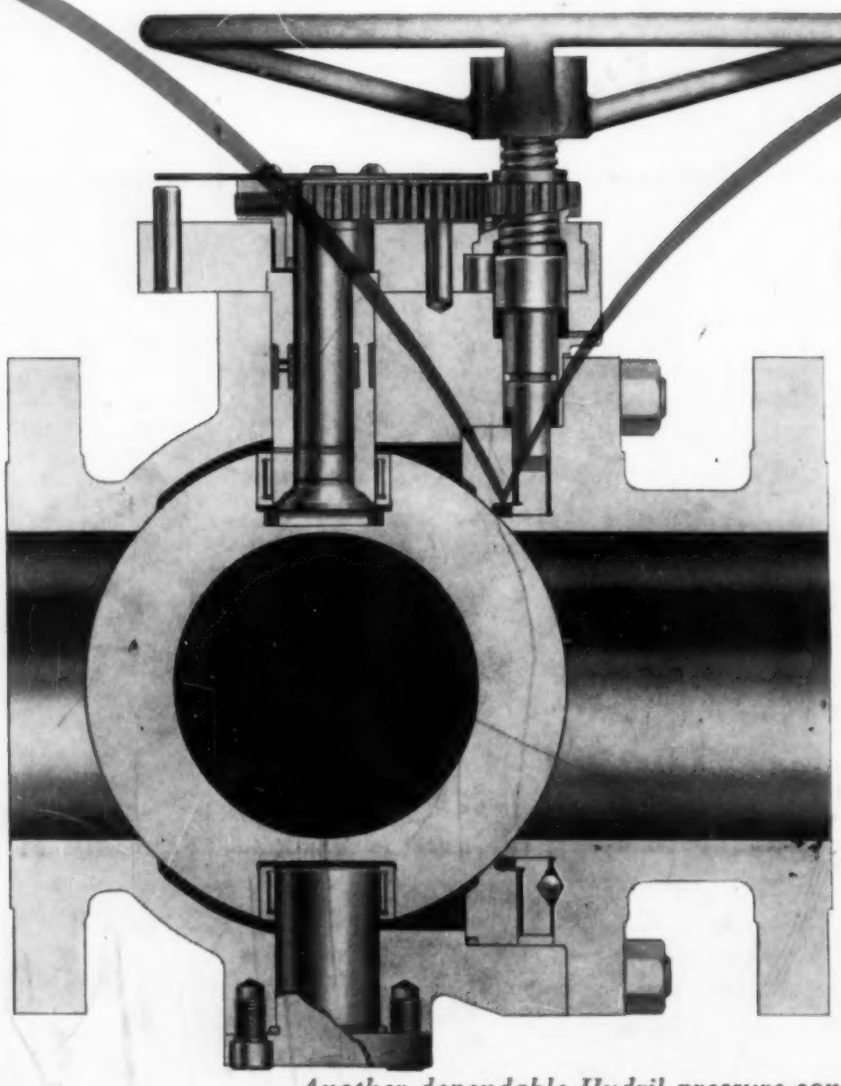
100th Anniversary of Oil in America 1959 **44th Anniversary of Gaso Leadership**

HYDRIL BALL PLUG Type "K" VALVES

COMPRESSIBLE PORT SEAL
provides
POSITIVE SHUTOFF



Hydril Ball Plug Valves achieve a positive seal against pressure from either direction because the fully enclosed packing ring is *mechanically pressed* tightly against the spherical plug and its seat after the valve is closed.

No other valve has this *controlled* port sealing feature.

SEEP-PROOF, BUBBLE PROOF. The fully confined packing ring is tightly squeezed against plug and seat so that it flows into surface imperfections, around sediment . . . even closes scratches that may occur on the sealing surfaces.

PORT SEAL RETRACTS for easy operation. The mechanical pressure against the port seal is released before plug rotation commences to eliminate seal ring wear and assure easy operation.

•

Write for catalog describing Hydril Ball Plug Valves in full detail.

Another dependable Hydril pressure-control product

HYDRIL COMPANY

714 W. Olympic Boulevard, Los Angeles 15, California

Sales offices: Bakersfield, Los Angeles, Ventura, California; Harvey, New Iberia, Louisiana; Youngstown Ohio; Oklahoma City, Tulsa, Oklahoma; Rochester, Pennsylvania; Corpus Christi, Dallas, Houston, Midland, Odessa, Texas; Casper, Wyoming; New York, New York; Calgary, Edmonton, Canada.

HYDRIL BALL PLUG Type "K" VALVES

COMPRESSIBLE PORT SEAL
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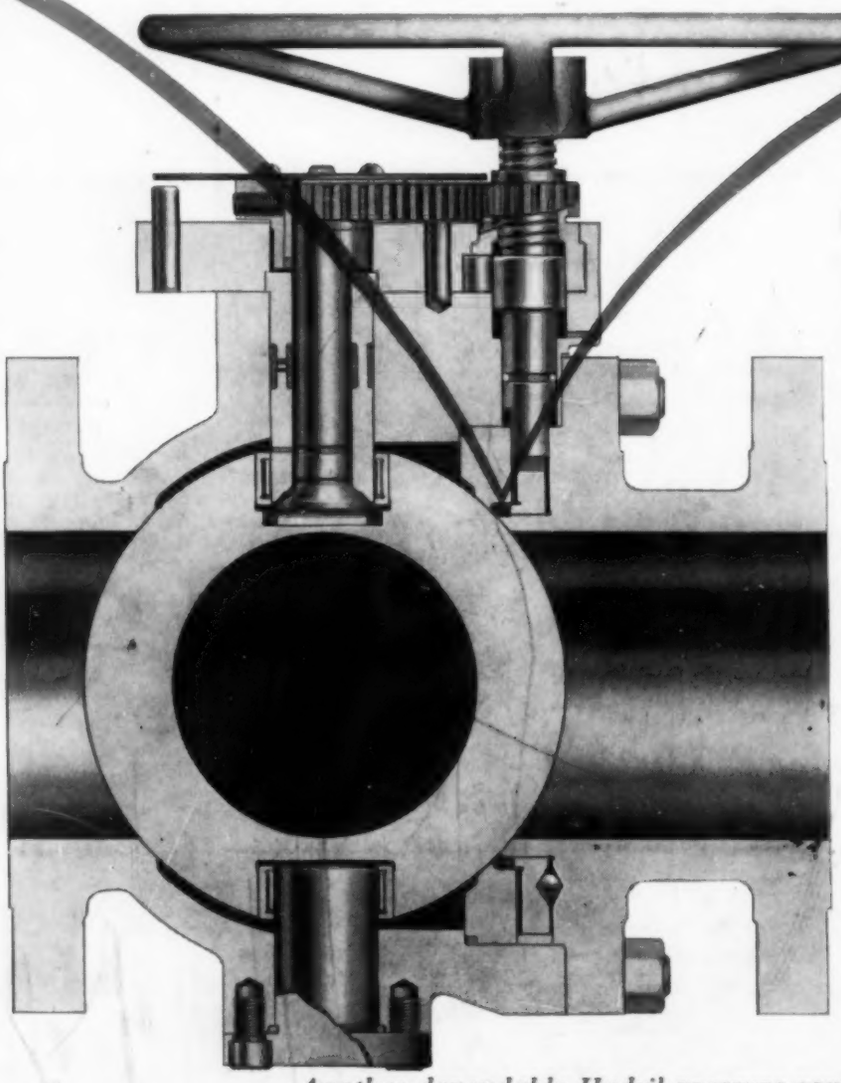

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